

ANNUAL REPORT

OF THE

INDIAN CENTRAL JUTE COMMITTEE

FOR THE YEAR

1946-47.

Calcutta

1947.

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ANNUAL REPORT OF THE INDIAN CENTRAL JUTE COMMITTEE FOR THE YEAR 1946-47

CHAPTER I

CONSTITUTION, AIMS AND OBJECTS.

The Indian Central Jute Committee was constituted by the Government of India in their late Department of Education, Health and Lands in their Resolution No. F.254/34/A dated the 28th May, 1936. It is a research organisation dealing with jute from field to factory. The Committee is financed out of the Central Revenues by grants-in-aid.

This is the tenth Annual Report of the Committee.

PERSONNEL.

2. A list of members of the Committee as on the 1st April, 1947 is given in Appendix VI. There were a few changes in the membership of the Committee during the year under report. Mr. N. N. Sen Gupta, Director, Government Test House, Alipore resigned his membership during the year and he was replaced by Prof. M. N. Saha, F.R.S., Palit Professor of Physics, Calcutta University. The Governor-General in Council, in exercise of his reserve powers, nominated Mr. K. K. Chetteur, M.A., Joint Secretary to the Government of India, Department of Commerce, New Delhi as a representative of the Commerce Department of the Government of India on the Indian Central Jute Committee.

The thanks of the Committee are due to Mr. N. N. Sen Gupta for the valuable services rendered by him during his term of membership. The Committee also welcomes the two new members—Prof. M. N. Saha and Mr. K. K. Chetteur.

3. Sardar Bahadur Sir Data Singh replaced Sir Herbert Stewart, C.I.E., I.C.S. as Vice-Chairman of the Indian Council of Agricultural Research and was the President of the Committee

during the year under report. Mr. I. G. Kennedy, C.B.E. continued to act as the Vice-President of the Committee.

MEETINGS.

4. The Indian Central Jute Committee held two half-yearly meetings, as usual, during the year *viz.* from the 20th to the 24th July 1946 and from the 18th to the 22nd January, 1947. The Annual General Meeting of the Committee was held on the 24th July, 1946 at which the Annual Report of the Committee for the year 1945-46 was approved.

The details of the subjects considered at these half-yearly meetings, the recommendations made by the Committee and the actions taken on them are given in the statement in Appendix XII. Some of the important recommendations and decisions made are summarised below:—

20TH MEETING—(20TH TO 24TH JULY, 1946).

(1) A scheme for the re-organisation of the Committee's Special Agricultural Staff in Bengal was accepted by the Committee subject to the condition that the financing of the scheme should depend on the Government of India's final decision in the matter of financing the Committee.

(2) The Committee, while considering the Annual Report of the Jute Agricultural Research Laboratories for the year 1945-46, recommended that attention should be given to the maintenance of quality and proportion side by side with the increase in the yield of the fibre.

(3) The Committee recommended that the Agricultural Research Laboratories should be asked to explore all possible methods of assessing the proportion of fibre and the quality of fibre in the growing plant and should consider also methods in which the proportion of the fibre was examined in labelled plants cut when the seed was mature.

(4) It was recommended that the spacing trials in respect of yield and quality should be carried a stage further

with large scale trials. This should be done at several centres so that factors such as Soil conditions and rainfall could be taken into account. As soon as the Committee was satisfied that the results were conclusive, a very serious effort should be made to convey those to the growers for adoption.

(5) The Director, Technological Research Laboratories should consider fully a collaborative scheme with the Indian Jute Mills Association Research Institute on the oiling of jute in addition to the blending experiments and see how the Committee's Technological Research Laboratories could help in the matter.

(6) The Committee decided that Dr. J. K. Chowdhury's scheme of "research on the impregnation of bleached jute fibres with suitable synthetic resins so as to improve its qualities", which had yielded encouraging results, should be continued for a further period of two years from the year 1947-48 on the existing basis and that a summary report covering the entire period over which the scheme had been in operation should be submitted by Dr. Chowdhury, accompanied, if possible, by samples to show the results of the work.

(7) The Committee also sanctioned the continuance of the work of Dr. B. C. Guha's scheme of Chemical Utilisation of Jute and Jute Waste for another year during 1947-48.

(8) The Committee appointed a new Grading Sub-Committee to consider the entire question of the grading of jute fibre on a more scientific basis.

(9) The Committee agreed to the continuance of the scheme of investigation into the economics of Jute Growing, which was being undertaken by the Economic Research Section, and decided that it should be extended to two more centres.

(10) The Committee decided that the report on the study of American Market for Jute and Jute Goods,

which was prepared by the Economic Research Section, should be published as a priced publication.

(11) The Committee passed a resolution to the effect that the Government of India and the Provincial Governments concerned should take immediate and effective steps to fix the maximum price of jute in parity with the prevailing price of paddy.

(12) The Committee adopted 'Study Leave Rules' for the employees of the Committee, which were framed on the basis of the rules obtaining in the Council of Scientific and Industrial Research.

21ST MEETING—(19TH TO THE 22ND JANUARY, 1947).

(13) The Committee appointed a Special Sub-Committee to go into the question of the re-organisation of the different Standing Sub-Committees after setting forth certain general principles for guidance in dealing with the question.

(14) It was decided that the Committee's Director, Jute Agricultural Research should prepare a scheme showing how the Committee could help the Provincial Governments in selecting the cultivators producing improved seeds in different areas and also in selecting the best areas for growing improved seeds.

(15) The Committee decided that Dr. B. C. Guha's scheme of bio-chemical investigations in the retting of jute should continue for a further period of 3 years from the year 1947-48 and that a definite technical programme should be drawn up by Dr. B. N. Ghosh, who was in charge of the scheme in consltation with Prof. S. P. Agharkar and placed before the next meeting of the Committee.

(16) The Committee directed that the Director, Technological Research Laboratories should put up a scheme before the next meeting for the study of new and extended uses of jute, keeping in view the resources, staff and accommodation available.

(17) It was decided that the Director, Economic Research should draw up a comprehensive scheme of the study of the Indian Market with a view to increase the consumption of jute and jute goods and place it before the next meeting of the Committee.

(18) The Committee considered a report submitted by the Director, Economic Research on the excess Productive capacity, of jute mill in India and decided that a copy of the report should be forwarded to the Indian Jute Mills Association with a request that the Association might co-operate in giving relevant information and the subject might be taken up for further study as soon as further information was made available.

SUB-COMMITTEES.

I. Local Sub-Committee

This Sub-Committee met once every month and disposed of mainly routine, administrative and urgent matters. Some of the important subjects, which it considered were:—

(1) A proposal from the Government of Orissa for the continuance of the scheme for the growing of Jute Seeds of improved varieties and their multiplication and distribution in Orissa for a further period of 3 years from the year 1946-47 was considered and in view of the fact that the scheme had proved successful during the period of 3 years during which it was financed, the Committee did not feel justified in recommending the further continuance of the grant by the Committee towards the scheme.

(2) The Sub-Committee recommended that, subject to the approval of the Government of India, Mr. A. S. Gillies, Manager, Experimental Spinning Plant, Technological Research Laboratories should be granted a certain number of free passages during the remaining period of his service under the Committee on the analogy of similar concessions granted to certain Government officials of non-Asiatic domicile of his status.

(3) On a representation from Mr. A. S. Gillies, Manager, Experimental Spinning Plant, Technological Research Laboratories, the Sub-Committee recommended that Mr. Gillies should be granted a pay of Rs. 1,400/- p. m. in the revised scale of Rs. 1,200-50-1600 with effect from the 18th April 1946.

(4) The Sub-Committee decided that Mr. A. S. Gillies should be put on deputation for a period of one month in continuation of the leave granted to him to enable him to visit certain machine-makers and other institutions in the U. K. in order to acquaint himself with the modern developments in the Jute mill industry.

(5) The Sub-Committee sanctioned certain additional temporary staff for the Economic Research Section to carry on two new items of work *viz.*

(*i*) analysis of the mofussil prices and other data collected by the Marketing Section, and

(*ii*) statistical analysis of Prof. J. C. Sen Gupta's data on Physiology of Jute plant.

(6) The Sub-Committee considered a report submitted by the Marketing Officer on the embezzlement of funds belonging to the Committee's Co-operative Multipurpose (Jute Sale) Society at Sarisabari and decided

(*a*) that the Co-operative Society at Sarisabari should at once cease to function,

(*b*) that searching enquiries must be made into all the previous accounts of the Society to see what had been happening in the past years,

(*c*) that the persons concerned in the defalcation should be prosecuted, and

(*d*) that similar searching enquiries should be made in the case of the Belakoba Society also.

(7) The Sub-Committee, while considering an application for leave from Mr. C. R. Nodder, Director, Technological Research Laboratories, recommended that

(*a*) the Committee should retain Mr. Nodder in its services up to his age of 60 years on the following conditions :—

(*b*) that he should be allowed, as a special case, to carry forward the leave that will remain at his credit on the day of his attaining the age of superannuation and to earn leave during that period under the 'Special Leave Rules' and that during the period of his extension, he and his wife should be given a certain number of free passages, to and from the U. K.

(*c*) that he should be allowed full 8 months' leave, as asked for, on the conditions stated above, and

(*d*) that the question of filling up the vacancy caused by Mr. Nodder's proceeding on leave should be considered after the receipt of the Government of India's reply to the above recommendations.

(8) The Sub-Committee set up a small Editorial Board consisting of the Vice-President, Secretary and the Sectional Heads for the Committee's Monthly Bulletin and agreed that suggestions for the improvement of the Bulletin in its features should be invited from the members and that eminent scientists and economists should be approached for contributing articles to the Bulletin on matters relating to Jute.

(9) The Sub-Committee considered a proposal for strengthening the staff of the Administration Section and sanctioned two new additional posts and also sanctioned upward revision of the scales of pay of certain responsible posts in this Section.

(10) The Sub-Committee sanctioned upward revision of the scale of pay of the Statistical Assistants of the Economic Research Section.

II. Agricultural Research Sub-Committee

Technological Research Sub-Committee

Marketing Sub-Committee

Economic Research and Publicity Sub-Committee

Each of the above Sub-Committees met twice during the year under report in conjunction with the meetings of the main Committee and considered the Annual report and research schemes and technical reports of the Sections concerned.

III. Appointments Sub-Committee

No meetings of the above Sub-Committee were held during the year.

IV. Other Sub-Committees

(a) Advisory Committees

Each of the Advisory Committees of the Agricultural Research, Technological Research and Economic Research Sections met once during the year under report previous to the Annual General Meeting of the Indian Central Jute Committee held in July 1946 and discussed in details the Sectional Annual Reports and the Progress Reports of the various Scientific University Schemes of the Committee and made necessary recommendations on them.

(b) Jute Planning Sub-Committee

The Jute Planning Sub-Committee met on the 4th December, 1946 to review the position with regard to the supply and demand for jute in the year 1946-47 and 1947-48. After a careful consideration of the relevant data the Sub-Committee came to the conclusion that a target of not less than 100 lac bales should be achieved in 1947-48. In order to attain this output, the area to be put under Jute in different provinces should be as follows:—

Province	lac acres
Bengal	28·49
Assam	2·45
Bihar	2·83
Orissa	26
	34·03

The Sub-Committee recommended that the Provincial Governments concerned should be acquainted with the facts and figures relating to future sowings which were discussed in the meeting and should be urged to:

(*i*) accept a target crop of not less than 100 lacs of bales for the season 1947-48, and

(*ii*) plan their acreage accordingly on the basis of last year's recommendations.

The Indian Central Jute Committee at its meeting held in January, 1947 accepted the above recommendations of the Jute Planning Sub-Committee and decided that the recommendations made by the Jute Planning Sub-Committee at its meeting held in May, 1945 regarding the steps to be taken for achieving the target figure, (which were mentioned in the last year's Annual Report) should be brought to the notice of the Government of India for giving effect to those recommendations.

The recommendations of the Jute Planning Sub-Committee were forwarded to the Government of India and the Provincial Governments concerned for necessary action.

ADMINISTRATION.

Mr. C. R. Nodder, O.B.E., Director, Technological Research Laboratories carried on the duties of the post of the Secretary of the Committee for the period from 1st April to the 2nd June, 1946, in addition to his own duties. The present Secretary took over charge from Mr. Nodder with effect from the 3rd June, 1946 and worked as such till the end of the year under report.

CHAPTER II

SCIENTIFIC INVESTIGATIONS

Agricultural Research on Jute

Dr. B. C. Kundu, M.A., Ph.D., was the Director of the Jute Agricultural Research during the year under report.

The work of the Laboratories was carried out according to the programme laid down by the Committee and the progress recorded was satisfactory. A brief summary of the work done during the year is given below:—

Season

At Dacca *capsularis* sowings were done in April while the *olitorius* trials were sown in May. Labour and bullock power difficulty was experienced frequently and interfered with the proper interculture of the crop.

Some attack of stem rot was experienced, due to which one *olitorius* trial had to be abandoned altogether, while in some other trials one or two blocks had to be rejected.

At Kishoreganj the sowings were done timely. The season was unusually wet and interfered with the weeding and thinning operations. Due to the creation of a brick-field adjoining our land the drainage has been considerably spoiled due to which three experiments *i.e.* line *vs.* broadcast, sowing rate and *olitorius* bulk trials had to be abandoned.

Both at Narayanganj and Konda substations the sowings were taken in hand towards the end of March. Post sowing agricultural operations were interfered with by the frequent spells of heavy and prolonged wet weather. At Narayanganj there was a hail storm during the seedling stage of the crop which did considerable damage to the crop.

At Dacca and Narayanganj communal trouble took place during the season which considerably affected the attendance and the normal working of the staff.

Collection of types

Due to the disturbed conditions in Bengal it was difficult to undertake tours in the interior of the districts for collection of jute types. However, two seed collection tours were undertaken in Faridpur and 24 Parganas districts—26 *capsularis* and 36 *olitorius* types were obtained. Two *olitorius* and one *capsularis* types were received from Belgian Congo and Argentine.

Breeding of improved jute

At Dacca and the three substations the breeding work entailed the carrying out of 62 trials. The material was studied for vigour, yield performance, plant height, base diameter, earlines, pigmentation and other plant characters.

After the analysis and study of the data promising cultures were carried forward for further work. *Olitorius* selections coming from 0·40—103 again proved their superiority over Chinsurah Green, having outyielded the latter by 20 to 30 per cent. The 1945 Technological test reports on these strains show that they give a quality ratio of 107 to 114 as compared to 101 of Chinsurah Green.

These *olitorius* strains are now being multiplied with a view to testing their performance under cultivator's condition in the subvention farm scheme.

The quick growing early maturing good quality *capsularis* strains reported upon last year were again tested at Belakoba and were found to yield 18 to 19 per cent. better than the controls.

Studies on vegetative rapprochement as a means of overcoming interspecific cross imcompatibility between *capsularis* and *olitorius* species, were started. Seeds from 1st generation grafts have been collected.

Fibre content in jute was found to vary considerably and work on classification of strains on fibre content has been started. A chemical method for estimating fibre from part of the crude bast of single plant has been developed. The removal of portions of crude bast was found not to interfere with seed

production. Fibre content estimation and seed production from the same plant will thus be possible and this can directly be applied in all selection work. It is hoped, application of the above method will, in course of time, help to isolate and develop high fibre content strains.

Subvention trials

Three Jute Agricultural Research Laboratories *capsularis* strains *viz*: C 39-212, C 41-13 and C 42 Nj-412 were tested under cultivator's condition at 94 centres (60 in Bengal, 12 each in Bihar and Orissa and 10 in Assam).

In the districts of Jalpaiguri, Tippera, Pabna and Noakhali, strain C 39-212 proved very successful yielding 43, 23, 22 and 14 per cent better than control respectively. In Assam strain C 41-13 and C 39-212 outyielded the control by 30 and 24 per cent. respectively.

Inheritance of character

The investigation carried out at the Jute Agricultural Research Laboratories till now have led to the indentification of 16 genes, 3 linkages and the location of some of the genes of five out of the seven possible linkage groups in *C. capsularis*.

The factor pair responsible for bitterness reported upon last year was found to be linked with branching habit and proved to be independent of corolla colour, anther colour and the pigmentation genes.

Monogene inheritance was established for anther colour in *C. capsularis*, light yellow anther being recessive to yellow. This factor pair was found to be completely linked with corolla colour. Monogenic inheritance of corolla and anther colour was also established in *C. olitorius*.

Improvement of cultivation

To study the economics and outturn of fibre of line versus broadcast sown jute, trials were conducted in five centres in Bengal. One of these trials *viz*: Kishoreganj trial had to be abandoned due to poor growth condition of the crop as has been mentioned earlier in the report. The line sowings again

proved to be more economical and profitable than broadcast sowings.

As has already been mentioned the trial laid out to study the influence of seed rate, harvest stage and duration of retting on the yield and quality of jute had to be abandoned, this experiment has been modified in consultation with the Director, Technological Research Laboratories and in future the experiment will be sown in lines with plants 2, 3 and 4 inches apart and line 8 and 12 inches apart.

To study the most economical and profitable method of growing jute seed, trials were conducted at two centres in Bengal. The crop was grown in broadcast plots as well as in line sown plots with plant 4, 6 and 9 inches apart and lines 12 and 15 inches apart. In the *olitorius* trial all line treatments except two outyielded broadcast sown plots, in the capsularis trial the response was not so favourable.

Cytology

The haploid chromosome number was studied in three strains of jute and was found to be seven, thus confirming the finding of previous workers.

Quality and retting

With the idea of bringing about quick retting as well as of producing more uniformly retted fibre experiments on gradual retting and retting after sorting the plants into different base diameter and height classes were conducted.

In the experiment on retting after sorting plants were sorted out into 4 different grades according to their height and base diameters, grade No. 4 forming the thinnest plants. The unsorted material comprised of equal weight of all the sorted out grades mixed together. Whole plants as also plants cut into top and bottom portions were steeped in separate bundles. Grade 4 plants were however not cut into top and bottom portions. It has been observed that there has been no appreciable difference in the period of retting in the different grades of sorted material as also between those and the unsorted material. This year most probably on account of the higher temperature of the retting water the top and bottom portions retted at the same

time, while the whole plants had only a slightly longer retting period being only one day more than that of the top and bottom portions in two steepings. On account of the top and bottom portions being retted in the same time, it is expected that there has been even retting in them and therefore the quality ratio is also expected to be good.

A search for the first appearance of tannin in jute reveals that the seeds themselves contain tannin. The fortnightly variation of tannins in D 154 and C. G. plants from seedling to harvest stage was conducted and it has been found that tannins increase with the growth of plants.

Biochemical studies

The study of the decomposition of jute plants during retting has yielded interesting results as in last year with regard to the acid as well as the alkaline phases as influencing nitrogen, bacterial number, lignin, etc. Dry matter, ash and furfural decrease gradually as retting progresses. Nitrogen remains nearly the same and only declines towards the end when the alkaline phase sets in. Lignin and pectin matter also decrease. The number of bacteria after an initial fall rises again. The dissolved oxygen in the retting water has been found to influence the number of bacteria.

In the study of nitrogen transformation it has been observed that the amount of Ammonia (NH_3) remains the same in both cropped and uncropped fields. Due to continuous nitrification of Ammonia, Nitrate (NO_3) is formed and gets accumulated which is more marked in uncropped plots than in cropped plots where it is gradually removed by the growing plants.

Diseases

In connection with the study on the physiological races cultures of *Macrophomina phasseoli* from Canada and U. S. A. and that of Rhizoctonia bataticola from Palestine were obtained.

Tests were carried out to determine the relative efficacy of the various commercial dusts *viz*: Granosan, Arasan, Agrosan-G and Nomersan. All were found effective.

In large scale operations rotating seed-dressing drums were found useful. It was further observed that sieving after treatment and waste of chemicals could be avoided by the use of exact quantity of chemicals necessary for an effective covering.

Results on experiments on storage of seeds show that seeds treated with Agrosan-G or Granosan can be successfully stored after proper sunning and subsequent treatments with Agrosan-G or Granosan. Seeds containing higher percentage of moisture lose viability to a great extent. Higher percentage of moisture also helps the fungus to remain viable in the seed.

Secondary infections of leaves caused by pycnospore could be checked to a certain extent by Bordeaux at 4:4:50 and also Perenox at 0·25 per cent strength. But if the infection proceeds beyond the lamina, sprays are not effective. Suitable 'sticker' was found to improve the adherence of Bordeaux.

Seed samples from different jute growing tracts of Bengal are being analysed. So far 152 samples have been received of which 50 have been analysed.

Treble doses of N (Ammonium sulphate, 5·4 maunds per acre) gave higher yield than double (3·6 maunds per acre) or single dose (1·8 maunds per acre). Potash was found helpful in checking disease.

Pests

The life-history of White-mite (Taroonemus latus, Banks) and the nature of damage caused by it have been studied. The damage is caused by the nymphs and the adults, which suck up the sap of the leaves, which crinkle and curl down resulting in premature fall. The egg hatches in a day. The Nymphal stage lasts $\frac{1}{2}$ day of which the active period covers about a day and the quiscent stage—6 to 8 hours.

Various insecticides in different proportions and dilutions were tried as spray and dust for controlling mite. Effective results were obtained with Lime-sulphur as dust and Rosin-fish oil soap solution as spray.

The life-history of *Ferrisia virgata* Ckll has also been thoroughly studied. The eggs are laid in advance stage of development and hatch soon after deposition. Nymphal stage lasts 16—22 days. There are three nymphal instars in female and four in the male. The adult males are winged.

The damage is mostly caused by the nymphs which suck up the sap of stems, pods and petioles. Adult females also feed

until it starts oviposition. The points of attack resist retting and result in barky fibre.

Nicotine sulphate (1 : 125) solution was found effective for controlling this mealy bug. Nicotine sulphate in soap solution was found effective against eggs and young larvae of jute Buprestid (*Trachys pacifica*, Kerr) but older larvae and pupae were not killed.

Pest and Disease Control Scheme at Narsingdi

The scheme has completed the fourth year of its activities. The total area under investigation this year was 49·65 acres. All the control measures evolved at the Central Laboratories were tried successfully against diseases and pests.

Comparative records of yield for 3 years from 1944 in treated and untreated plots show that in general the treated plots gave higher yield.

The economics of pests and disease control were studied. The total cost of control in 49·65 acres was Rs. 171-2-9 and the cost of seed treatment was less than 5 annas per acre. In the treated plots an average increase of 2 maunds 16½ seers of fibre per acre was obtained resulting in an increased profit of Rs. 43/- per acre with jute selling at the rate of Rs. 20/- per maund.

Outstations

Land for Outstations at Mymensingh, Jessore and Rangpur has been selected and is being acquired with the help of the Government of Bengal.

Publications

During the coarse of the year 4 scientific papers were issued by the Jute Agricultural Research Laboratories.

TECHNOLOGICAL RESEARCH ON JUTE.

Mr. C. R. Nodder, C.B.E., Director, Technological Research Laboratories was in charge of this branch of research. The work of the laboratories was carried out according to the programme laid down by the Committee and the progress recorded was satisfactory.

A summary of the more important investigations made during the year is given below.

Spinning Technique

Promising results have been obtained in spins with two pounds of (cut) jute spread at the breaker, using the ordinary mill machinery throughout. With suitable precautions it appears that reliable information as to spinning quality can be obtained even with this small quantity of fibre. The method has already proved useful in spinning samples of Celafibre and Argentine jute, of which only small quantities were available.

Background Research

Progress has been made in the study of the hemicellulose and lignin of the jute fibre. The former makes up well over 20% of the clean raw material and the latter over 10%. It has been shown that the affinity of jute for basic dyes is not mainly due to the presence of lignin. The "acid value" and dye absorption increase steadily as lignin is progressively removed by sodium chlorite treatments.

Results so far obtained give the following provisional picture of the nature and rôle of the hemicelluloses: They contain hexosans and pentasans in roughly equal amount. Mild alkaline treatments remove mainly hexosans. The pentosans may form chain-molecules, with ether linkages, with the polyuronide constituents and the latter are largely responsible for the affinity for basic dyes. There may be ester linkages between the polyuronide constituents and the lignin. It is considered unlikely that the xylans are combined with the cellulose pyranose units in the form of chain-molecules. The pentose-polyuronide-lignin complex may encrust the cellulose micelles. The hexosans may be largely present in the intercellular layers.

An interesting observation is that jute fibre bleached (delignified) by means of sodium chlorite treatment retains its white colour for a long period if stored under alcohol, even in indirect sunlight. When exposed to air the similarly bleached

fibre gradually becomes yellowish. The hemicelluloses, particularly the hexosan constituents, are probably partly responsible for the yellowing of partly bleached jute on exposure, though residual lignin and oxy-cellulose may also contribute.

Tests on Jute Agricultural Research Laboratories Samples

Of the selected strains C39-212, C41-13 and C42Nj-412 grown at the subvention farms, the first has generally given the best quality in the samples so far tested from 14 widely separated farms. It was also, on average, a little better than the Locals. Since it yields better than the Locals it is a promising selection, but the results from many other farms are awaited.

Tests on the 1945 crop "spacing, stage of harvesting and duration of retting" trials have given results in line with those of former years, the closer spacings giving fibre of the best quality. Once more the harmful effect of over-retting is very clearly seen.

The results of the 1945 crop manurial trials show some interesting features. Plain nitrogenous manuring has given results which are as good as any in respect of quality. There are signs that heavy potash manuring is detrimental, especially if not supported by ample nitrogen.

No very important differences in quality were found in experiments in which different coverings were used during retting, though there is an indication that sugar cane leaf is harmful. The best results were obtained with bamboo leaf, though no covering at all was nearly as good. Further work appears to be necessary.

Fibre Characters and Spinning Quality

Some 26 samples of known spinning quality have been examined for the following characters: (*a*) ballistic work of rupture of twisted bundles of fibre, (*b*) fineness, (*c*) flexibility, (*d*) torsional rigidity, (*e*) bulk density, (*f*) breaking twist, (*g*) diameter of twisted bundles, (*h*) average reed-weight, (*i*) average reed-weight per metre. The results give promise that a prediction equation can be worked out that will enable spinning quality to be assessed with fair accuracy. It is proposed to

extend the number of samples examined during the coming year and then to discuss the results in detail.

Important work for the future is to devise tests that will give useful prediction of the behaviour of fibre in drafting, a matter that is closely related to yarn regularity, and hence to yarn strength.

Grading

The position reached was explained at the meetings of the Indian Central Jute Committee in January 1947 and a new Sub-Committee was set up. It was decided that it was necessary to effect improvements gradually. Although falling just outside the year under review, it may be mentioned that a new scheme was agreed to at the first meeting of the new Sub-Committee held on 2nd April, 1947. This new scheme aims mainly at removing from Bottoms, and placing under a new mark between Middles and Bottoms, white jute with 26 to 50% of cuttings (or tossa jute with 26 to 40% of cuttings). This is a small improvement, which might be followed later by similar small improvements, step by step, if the present proposals are adopted.

Moisture Relationships

Sixteen samples of jute collected up-country during the moist months of August and September were examined for moisture regain. Nine of these samples showed regains below 21% and, as before, it appears that, with proper care, there is no reason why the regain should exceed 20% in jute held ready for sale up-country during the rainy season. On the other hand it would in general hardly be possible to ensure a regain below 20% during this period.

Storage of Sugar

The behaviour of sugar stored in an ordinary jute sugar bag was compared with that of sugar stored in a bag which had been treated with a strong antiseptic, over 100 lb. of sugar being used in each case. The bags were kept under ordinary conditions from July to September. There was a striking difference in behaviour. The untreated bag showed damp patches after a few days and attracted fleas and insects and syrup collected, in a tray placed below the bag, after 38 days. The treated bag

kept dry for a much longer period and syrup did not collect until after 66 days.

This experiment confirms very forcibly that suitable antiseptic treatment will delay deterioration for a considerable period. No such treatment can be expected to prevent deterioration indefinitely and it is important that the sugar should be in good condition (dry and pure) when bagged.

Jute Competitors

Three samples of roselle fibre were spun and proved to be inferior in general quality to ordinary good white jute. Two samples of mesta pat (*Hibiscus cannabinus*) were also spun and were found to be far inferior to average white jute. A sample of Argentine jute (*olitorius*) was examined and found to be of low quality, on account of late harvesting and poor handling. (Small samples seen in previous years appeared to be of much better quality).

Special Treatments of Yarn and Fibre

Steeping in a one per cent solution of caustic soda at room temperature for one hour was found to reduce the wet strength of a jute yarn to about half. There was, however, a noteworthy improvement in the softness of the yarn. Subsequent steeping in sodium chloride (common salt) solution produced a definite increase in strength, but this is of theoretical rather than practical interest and the original wet strength was not nearly reached. Other experiments on similar lines have been made and some interesting results are being followed up in further experiments.

New Uses, etc.

Samples of softened jute ply-yarn were dyed in dark shades with direct dyes of good fastness and a report on their suitability for knitting into jerseys is awaited.

The possibilities of using insulating boards, made from shakered jute fibre, in refrigeration engineering have been followed up, but there has been an unfortunate delay due to the loss of a consignment of fibre in transit to the paper-mill where the boards were to be made.

University Research Schemes

The University Research Schemes, financed by the Committee continued to work under the able guidance of the Professors in charge of the schemes. The details of the schemes now working are given below :—

Name of the scheme.	Name of the professor in charge of the scheme	Year of working of the scheme	Amount paid during 1946-47	Total amount paid upto the 1946-47
			Rs.	Rs.
1. X'Ray research on jute.	Professor M. N. Saha, D. Sc., F.R.S., Palit Professor of Physics, Calcutta University.	5th year	7,603	26,521
2. Chemical Utilisation of jute and jute waste.	Professor B. C. Guha, D. Sc., Head of the Department of Applied Chemistry, Calcutta University.	5th year	5,292	26,308
3. Bi-chemical Investigation on the processes involved in the retting of jute.	Do.	5th year	4,340	20,636
4. Impregnation of bleached or delignified jute fibre with suitable synthetic resins so as to improve its quality.	Professor J. K. Chowdhury, Ph. D., Head of the Department of Chemistry & Soil Science, Dacca University.	5th year	5,336	22,5106
5. Physioolgy of the growth & development of jute plant.	Professor J. C. Sen Gupta, D. Sc., Prof. of Botany, Presidency College, Calcutta.	3rd year	6,304	15,302
6. Effect of X'Ray, neutrons and gamma rays on jute.	Dr. D. M. Bose, D. Sc., Director, Bose Research Institute, Calcutta.	2nd year	5,904	9,179
			34,806	1,204,5

The progress of work of all the schemes mentioned above was satisfactory.

CHAPTER III

ECONOMIC INVESTIGATIONS

MARKETING AND TRANSPORT OF JUTE

During the year under report, Mr. S. M. Gupta, Officiating Marketing Officer was in charge of the Marketing Section. The work was carried out according to the programme laid down by the Committee. A brief summary of the main items of work done in the section during the year under report is given below:—

I. EXPERIMENTAL CO-OPERATIVE JUTE SALE SOCIETIES IN BENGAL

Two Co-operative Multipurpose Jute (Sale) Societies had been functioning under the auspices of the Committee since 1942-43—one at Sarisabari (Mymensingh) and the other at Belakoba (Jalpaiguri). The objects of these two Societies were to train the growers in Co-operative Marketing.

During the year under report, a defalcation of the funds of the Society at Sarisabari was brought to light. As soon as this was detected, the Committee decided to withdraw its financial assistance from the Society with immediate effect and to make searching enquiries into the past accounts of the Society. The persons involved in the defalcation were criminally prosecuted. After investigation, it was found that the amount involved in the defalcation was to the extent of Rs. 3,585/-. Out of this amount, a sum of Rs. 1,700/- was recovered. This Society ceased to function from September 1946. During the months of July and August, when this Society was in existence, it purchased about 100 maunds of jute and advanced a loan of Rs. 1,075/- to the members. All the fibre purchased was disposed of and the loan recovered before the Society was closed down.

The Belakoba Society purchased 3,027 maunds of jute and made a gross profit (as per trading account) of Rs. 1,927/-

during the year under report. There was some improvement in the loyalty of the members—129 members supplied about 85 per cent. of the total jute purchased by the Society as against 90 members supplying about 75 per cent. in the previous season.

The Committee, at its meeting held in January last decided that the two experimental Co-operative Jute (Sale) Societies should be abolished from the financial year 1947-48. Accordingly, the Belakoba Society was also closed down from the 31st March, 1947.

II. Grading of jute by peripatetic Grading Parties

The three Jute Grading Parties operating in the Sarisabari, Akhaura and Belakoba areas continued to function during the year under report. The object of this scheme was to teach the growers in the art of grading jute fibre in the recognised standard grades. The growers took considerable interest in the work of the parties and in many cases, they themselves graded some of their jute. From a comparison of the average prices received by the growers for unassorted jute with those received by them for their jute sold on grade basis, it was found that they were gaining by 5 or 6 annas per maund when they sold their jute on grade basis.

It is gratifying to note that the Government of Bengal realised the utility of this scheme, and themselves undertook it on a wider scale. The Committee at its January 1947 meeting decided that it should no longer continue this scheme but should request the Government of Bengal to take over these Grading Parties of the Committee from the year 1947-48.

The three Grading Parties were accordingly disbanded from the 28th February 1947. The Government of Bengal have agreed to take over the Committee's staff employed on this scheme.

III. Dissemination of Calcutta Loose Jute Prices

Calcutta Loose Jute prices were disseminated to 34 centres in Assam, Bihar and Orissa. Till the 3rd week of October weekly prices were sent out to the centres. After that, prices were sent on daily basis consequent on the fluctuations in price due to de-control of jute prices.

IV. Marketing of fibre grown from proved seed

This scheme continued as in the previous year. The results showed that both yield and grade outturn of the crop from the departmental seeds were better than that of the local crops—thus enabling the growers to fetch better value. The Committee decided at its last meeting held in January 1947 that this scheme should be discontinued from the year 1947-48.

V. Study of Indian Market with a view to increase the consumption of jute and jute goods

Some exploratory survey was undertaken to find out the possibilities of the jute Cottage industry in Domar (Rangpur) and Setabganj (Dinajpur) where the Committee has set up two Co-operative Societies of Cottage Workers in Jute Spinning and Weaving. From the contacts made by the Committee's officiating Marketing Officer with the markets in Bombay, Nagpur, Akola, Jalna and Indore, it has been gathered that a good market for some of the Cottage Industry products of jute may be found in those areas.

VI. Co-operative Societies of cottage workers in jute spinning and weaving

Two Co-operative Societies of Cottage Workers in jute spinning and weaving—one at Domar (Rangpur) and the other at Setabganj (Dinajpur)—were established in February, 1946. Much progress could not be made in the work of these two Societies during the year under review primarily owing to the difficulties in recruiting suitable staff for work on these two Societies.

The Domar and Setabganj Societies have so far enrolled 394 and 288 members respectively and have collected Rs. 442/- and Rs. 265/- towards their share capital. These Societies are still in their infant stage and no business worth mentioning has yet been conducted by them. It is hoped that these two Societies will grow in time and prove their utility.

VII. Collection of jute prices and other statistics from mofussil areas in Bengal

In accordance with the decision of the Committee, the scheme was taken over by the Economic Research Section from

April, 1947. The data collected by the Marketing Section on this scheme during the year were made over to the Economic Research Section for statistical analysis and report.

ECONOMIC RESEARCH.

During the year Mr. D. Ghosh, M.A. (Cantab), Bar-at-Law, was in charge of the section. The main activities of this section during the year is summarised below :—

The research activities of the Economic Research Section increased considerably during the year under review. There was a large addition to its staff, although the new posts could not be filled up in the time on account of communal disturbances. The programme of work for the year consisted of the following items :—

(1) Preliminary Investigation into the Economics of Jute Growing (2nd year);

(2) American Market for Jute and Jute Goods;

(3) Revision of the Study of World Consumption of Jute;

(4) Excess Productive Capacity of Jute Mills;

(5) Brochure on Jute Satistics;

(6) Study of Mofussil prices of jute and other statistics;

(7) Statistical Analysis of Prof. Sen Gupta's data on Physiology of Jute.

Investigation into the Economics of Jute Growing

This investigation was started in 1945 on a small scale as a pilot enquiry. The report of the first year's work, (which was considered by the Committee in July 1946), threw light on important problems of jute growing. It also showed that technique of investigation was basically sound, but indicated the need for both intensified enquiry at each centre and extension over wider areas. The Committee decided that the investigation should be continued for a further period of two years, the number of centres being increased from three to five in the third year. The report of the work in 1946 will be considered by the Committee in July 1947. In 1947 two more centres have been opened and the number of farms under investigation at each

centre has been raised from 20 to 50. Selection of farms has been done by stratified sampling so as to improve the reliability of conclusions drawn from the enquiry.

American Market for Jute and Jute Goods

This study was undertaken to explore the nature of the demand for jute in the United States. Although adequate data were not available, a report has been prepared which gives an insight into the working of the American Market for jute and jute goods. The report is ready for publication.

Revision of the Study of World Consumption of Jute

A Research Bulletin embodying results of a study on the subject was published in 1941. A second edition of this work has been prepared which gives revised data for earlier period and up-to-date new data as far as available. It is ready for publication.

Excess Productive Capacity of Jute Mills

The original line of work on this subject had to be given up as the necessary data were not forthcoming from the Indian Jute Mills Association. As a second best, the data contained in the balance-sheets and statements of accounts of a few representative mills were made the basis of the present study. A report was prepared in which cost of production of eight jute mills was analysed. No definite relation between unit costs and changes in output could be established. The report also considered the measure and significance of excess capacity of the Jute Mills in India.

Brochure on Jute Statistics

This brochure is intended to give all important statistical data on jute as far as available at present. It will also contain summary tables indicating the saliant features of jute cultivation, trade and industry. The brochure is expected to be ready soon.

Study of Mofussil Prices of Jute and other Statistics

The object of this study is to throw light on the relationship between prices of jute in primary and secondary markets. Field staff have been engaged in a number of Mofussil centres

for collection of data on prices, arrivals, stocks, grade outturn etc. The data relating to the Sarisabari area in the district of Mymensingh have been analysed and a report on it will be placed before the Committee at its meeting in July 1947.

Analysis of data on Physiology of Jute

The data were obtained by Prof. J. C. Sen Gupta from his experiments on physiology of jute carried out in 1945. The statistical analysis of the data has been entrusted to the E. R. Section. The work is not yet complete, but an interim report will be placed before the July meeting of the Committee.

Publicity

During the year under report, Mr. K. I. A. Quaderi, Publicity Officer was in charge of the Publicity Section. The work of the section was carried on according to the programme laid down by the Committee. The progress of work of the section during the year on main items is summarised below :—

(1) *Production and Distribution of the Committee's Monthly Bulletin.*—A small Editorial Board consisting of the Vice-President, Secretary and the Sectional Heads of the Committee was set up to improve the Bulletin in its features. It was decided that eminent scientists and economists should be approached for contributing articles to the Bulletin on matters relating to jute. The Editorial Board met every month and scrutinised the MSS of the Bulletin before publication. They also made suggestions for the improvement of the Bulletin in various aspects. It has also been decided to change the title of the Bulletin to 'Jute Bulletin' from its April 1947 issue. During the year the Bulletin was published regularly with useful information and interesting articles and maintained its popularity.

(2) *Press propaganda.*—During the year, the section issued a number of press notes on various subjects which received due publicity in India and abroad.

(3) *Radio Publicity.*—The Calcutta Station of the All India Radio gave its useful co-operation by broadcasting extracts from important press notes issued by the section.

(4) *Price Dissemination.*—During the year, price cards giving Calcutta loose jute prices were issued regularly to 36 centres in Bihar, Assam and Orissa.

(5) *Jute Museum.*—A nucleus of the 'Jute Museum' was established in the Committee's Central office at No. 4, Hastings St., Calcutta during the year. It has not yet been fully developed. A number of valuable collections of manufactured articles of jute and various charts, diagrams and pictures showing the growth, cultivation and marketing of jute have since been made and arranged in the museum. The members of the Committee showed keen interest in the exhibits when they saw them in January last. The museum is planned to be "an up-to-date history of jute from the field to the factory and onwards to the markets of the world". The desired progress in the development of the museum could not be made during this year owing to frequent disturbances in the city. It is hoped that the museum will be further developed during the next year.

Thanks of the Committee are due to Messrs. Birla Brothers Ltd. for their generous action in making a free gift of some of their speciality jute products together with necessary furniture and equipment for their display in the Committee's jute museum.

CHAPTER IV

GENERAL

Special Agricultural Staff

The Committee continued to maintan its Special Agricultural Staff in Bengal, Bihar, Assam and Orissa under the control of the Provincial Departments of Agriculture. The strength of the staff also remained the same as was in the previous year and was as follows:—

Bengal—1 Inspector, 15 Overseers and 60 demonstrators.

Bihar—6 Overseers and 18 Kamdars.

Assam—2 Inspectors and 8 Demonstrators.

Orissa—2 Overseers and 8 Kamdars.

2. Out of the staff employed in Bengal, the Committee continued to employ, under its direct control, 3 Overseers and 3 demonstrators for work on the joint scheme of the Jute Agricultural Research and Marketing Sections for intensive work on jute at 3 centres in Bengal *viz.* Sarisabari, Belakoba and Gangasagar.

3. The expenditure on the staff during the year was as follows:—

Bengal	...	...	...	90,081
Bihar	...	...	...	23,024
Assam	...	...	...	10,226
Orissa	...	...	...	5,669
				1,29,000

4. The Indian Central Jute Committee, at its meeting held in July 1946 considered a scheme for the re-organisation of the Special Agricultural Staff in Bengal, which was submitted by the Director of Agriculture, Bengal and accepted the scheme subject to the condition that the financing of the scheme should depend on the Government of India's final decision in the matter of financing the Committee. The reorganisation scheme could not

be given effect to during that year as funds were not available. The question whether the Committee should continue to finance the scheme for the Employment of Special Agricultural Staff in the Jute Growing provinces of Bengal, Bihar, Assam and Orissa in view of the fact that the staff is employed on developmental work is under the consideration of the Committee.

Scheme for the supply of jute seeds of improved varieties

The Committee accepted a scheme, which was submitted by the Government of Assam for the production of improved Jute seeds in Assam for a period of one year only during 1947-48 at an estimated recurring cost of Rs. 2,811/- to be shared by the Provincial Government and the Committee on a 50:50 basis.

The Committee also directed that a scheme should be drawn up as to how the Committee could help the Provincial Governments in selecting the cultivators producing improved seeds in different areas and also in selecting the best areas. The scheme on the subject is being drawn up by the Committee's Director, Jute Agricultural Research.

Advice to Provincial Governments

Enquiries on various subjects received from the Provincial Governments and the Central Government during the year were promptly attended to. At the request of the Government of Bengal, the Committee permitted its Director of Economic Research and the Marketing Officer to serve on their new Jute Enquiry Committee, which was recently set up. The Committee also furnished necessary papers to the Government of Bengal on the Stabilisation of Jute Prices which were required by them for the use of the members of the Bengal Jute Enquiry Committee. On the recommendation of the Jute Planning Sub-Committee, the Committee advised the Provincial Governments in regard to the fixation of the acreage of jute for the year 1947-48. The Committee's Director, Jute Agricultural Research gave necessary advice and technical guidance to the Provincial Departments of Agriculture for the conduct of the Jute Subvention farms in Bengal, Bihar, Assam and Orissa.

CHAPTER V

ACKNOWLEDGEMENTS

Secretary is grateful to the President Sardar Bahadur Sir Datar Singh and to the Vice-President Mr. I. G. Kennedy, C.B.E. for the valuable advice and guidance he received from them.

Secretary thanks the Sectional Heads, the research workers and other employees of the Committee for their loyalty, efficiency and devotion to duty.



G. C. SEN,

Secretary.

APPENDIX I

ANNUAL REPORT OF THE AGRICULTURAL RESEARCH SCHEME 1946-47.

SEASON

At Dacca, the land allotted for jute was handed over to us sometime in March 1946. Practically no previous tillage had been done and the land was in very poor condition and overgrown with weeds. By the middle of April *capsularis* sowings were started and continued till the end of April as opportunity occurred. The *olitorius* sowings were done in May. Due to the poor condition of the land the sowings had to be protracted. The land had to be prepared as showers occurred and after preparation of land for particular sets of experiments time elasped before sowing conditions were favourable again. Labour and bullock difficulty was experienced frequently and interfered with proper interculture of the crop. Stem-rot attack was severe and badly affected some of the experiments, one *olitorius* trial had to be abandoned altogether, while in a few other trials one or two blocks had to be rejected due to deaths from stem-rot.

At Kishoreganj, the sowings were started by the beginning of April and were completed by the middle of April. Weeding and thinning operations were interfered with by the unusually heavy rains experienced during the season. Due to the creation of a brick-field adjoining our land the drainage has been considerably spoiled, in one of the fields it had become very bad and after a shower, water stood for days and when it did drain off the soil stayed soggy and unworkable for a long time. Due to this three experiments *i.e.*, line Vs broadcast, sowing rate and *olitorius* small bulk trial had to be abandoned.

At Narayanganj, the sowings were commenced towards the end of March and were completed by the first week of April. Sowings were done under ideal conditions, heavy rains followed some of the sowings and caused the formation of a hard crust due to which the germination was not satisfactory in these experiments. There was a hail storm on 7th April, 1946, which considerably damaged the young seedlings; further prolonged

spells of wet weather interfered with weeding and thinning operations.

At Konda the sowings were done between 26th March, 1946 and 30th March 1946. Germination was good in all the experiments. Rainfall was not well distributed during the period of growth and development of the crop. There were frequent spells of wet weather which interfered with post sowing agricultural operations.

At Dacca and Narayanganj, serious communal trouble took place during the season which considerably interefered with the attendance and the normal working of the staff.

I. COLLECTION OF VARIETIES AND TYPES

With the disturbed condition in Bengal it has been difficult to undertake tours in the interior of the district for collection of jute types. However, two seed collection tours were undertaken in Faridpur and 24 Parganas districts and 26 *capsularis* and 36 *olitorius* types were obtained.

One *olitorius* type was obtained from Belgian Congo and a *capsularis* and *olitorius* type each from Argentine. These types will be grown and studied during the coming season.

11. BREEDING OF JUTE

At Dacca and the three substations the breeding work entailed carrying out 62 trials. The material in these trials was studied for yield, vigour, plant height, base diameter, earliness, pigmentation and other plant characters. After analysis and scrutiny of the data the following 955 selections were carried forward from the 20467 primary and secondary selections made.

Primary selections.—64 *capsularis* and 51 *olitorius* district types were grown and studied in replicated randomised layouts. After a study of various characters 1335 field selections were made. The data of these field selections were further scrutinized in the laboratories and 437 selections have been finally retained for tests during the coming season.

First year test of selections.—The 324 *capsularis* and 136 *olitorius* primary selections brought forward from 1945 season

were tested in 21 replicated progeny rows. A large number of secondary selections were made. On the basis of yield performance and other characters 241 selections in the best cultures have been carried forward.

Second year test of selections.—The 462 selections brought forward from 1945 first year trials were tested in 16 compact family layouts. From this material 207 selections in the best families have been retained for further work.

Third year test of selections.—The 121 selections carried forward from 1945 second year trials were tested in 4 compact family block layouts. On the basis of the yield performance of the cultures 46 selections from the best families have been retained.

Fourth year test of selections.—The 46 selections carried forward from 1945 third year trials were tested in 3 compact family block layouts; four families each having 5 progenies have been retained for further study.

Sixth and seventh year combined test of selections.—Material coming from the 5th and 6th year trials of 1945 were tested in one compact family block layout, as there was not enough material in each stage to test them in separate layouts.

Three families of 0·40-103 selection proved to be 20 to 30 per cent superior to Chinsurah Green, and another family proved to be 8 per cent better.

Small bulk trial.—Bulked seed of the material tested in the combined 6th and 7th year trial was also tested in two small bulk trials, the results confirmed the findings of the combined family block test. The 1945 technological test reports on these strains show that these give a quality ratio of 107 to 114 as compared to 101 of Chinsurah Green. The 1946 quality test reports are not yet available. In view of the good quality and the consistent good performance of these selections in the past and this year's performance in bulk as well as the combined trials, it is now proposed to multiply the best of these selections for trials under cultivators' conditions in the subvention farm scheme.

Multiple crossing.—With a view to synthesise high yielding, non-branching and early maturing strains, a programme of compound crossing of eight *capsularis* types was initiated in 1944. During the year under review progeny of the second mating were grown, some 4,000 plants were so obtained, these were studied for various characters and plants selected for the 3rd mating; 550 crossed pods from this mating have been obtained and will be studied during the coming season.

Selection for resistance to stem-rot.—Sixteen families involving eighty progenies were grown in two separate family block trials. Pycnospore sprays were given at suitable intervals. Differences in the susceptibility to stem-rot against families were found to the insignificant ·29 cultures were selected for next year's trials. Tables I and II show the comparative record of performances of the selected cultures for the last four years.

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TABLE I

Selection from Stem-rot Trial No. 1.

Selections	1943		1944		1945		1946	
	Stem-rot Per cent	Per cent on control	Stem-rot Per cent	Per cent on control	Stem-rot Per cent	Per cent on control	Stem-rot Per cent	Per cent on control
372-4 ...	13·9	34·6	21·6	30·2	23·3	42·5	21·3	84·2
377-13 ...	...	...	23·5	32·9	22·4	40·9	19·7	77·9
378-17 ...	...	...	...	...	22·2	40·5	18·4	72·7
386-25 ...	...	...	18·5	25·9	21·9	40·0	19·6	77·5
386-27 ...	...	...	...	...	...	...	16·6	65·6
386-28 ...	...	...	...	...	...	...	17·1	67·6
387-34 ...	...	...	...	...	22·7	41·4	21·7	83·4
387-36 ...	...	...	...	...	...	...	21·7	83·8
388-42 ...	...	...	...	...	22·3	40·7	17·8	70·4
388-43 ...	...	...	...	...	...	...	17·9	76·8
388-45 ...	...	...	...	...	...	...	18·2	71·9
389-52 ...	...	...	...	...	20·4	37·2	17·2	68·0
517-115 ...	...	...	...	...	17·4	31·7	21·4	84·6
517-118 ...	...	...	...	...	...	...	20·2	79·8
521-122 ...	...	...	...	...	19·5	35·6	18·6	74·3
521-124 ...	...	...	...	...	...	...	20·8	82·2
403-60 ...	...	...	...	...	20·7	37·2	20·4	80·6
403-63 ...	...	...	22·6	31·6	...	...	20·2	79·8
Control (D 154) ...	40·2	100·0	72·2	100·0	54·8	100·0	25·3	100·0
Mean Stem-rot per cent less than D154 (Control)	56·6		68·8		61·9		23·5	

TABLE II

Selections from Stem-rot Trial No. 2

Selections	1943		1944		1945		1946	
	Stem-rot per cent	Per cent on control	Stem-rot per cent	Per cent on control	Stem-rot per cent	Per cent on control	Stem-rot per cent	Per cent on control
405–73	...	...	22·6	31·6	20·7	37·9	15·6	69·0
405–75	...	...	...	...	...	...	16·6	73·5
405–79	...	...	...	...	...	...	14·9	65·9
404–67	...	...	...	...	18·5	53·8	9·9	43·8
404–68	...	...	...	...	...	...	10·4	46·0
404–71	...	...	...	...	...	...	11·5	50·9
407–82	...	...	...	...	18·6	33·9	12·5	55·3
407–84	...	...	...	...	...	...	12·4	54·9
407–85	...	...	...	...	...	...	11·6	51·3
485–91	16·3	40·5	15·8	22·1	20·6	37·6	15·4	68·1
Control (D154) ...	40·2	100·0	72·2	100·0	54·8	100·0	22·0	100·0
Mean stem-rot per cent. less than in D 154 (Control)	56·6		68·8		61·9		42·1	

Further selections were made from replicated trials of *capsularis* species. Selections were made on the basis of actual counts as usual. Twenty three selections were made. All of these will be tested for stem-rot resistance in the next season.

Early varietal trial.—The quick growing, early maturing, good quality strains reported upon last year were tested for second time at Belakoba; these strains again outyielded the Jalpaiguri locals by 18 to 19 per cent.

Report of 1946 quality tests on these strains are not yet available. In 1945 these strains gave a quality ratio of 111 to 115 as against the 98 and 103 of the controls.

Polyploidy and interspecific hybridization in jute.—With the object of producing polyploids seeds of Chinsurah Green and D 154 were treated with 0·1 per cent aqueous solution of Colchicine which had proved successful before. The germination was very low in seeds which were soaked in water prior to Colchicine treatment, while seeds without any presoaking showed comparatively better germination. The Colchicine treatment did not prove effective, and none of the plants from treated seeds showed any morphological characters indicating polyploidy.

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Internode length and its correlation with ultimate fibre length.—Some amount of preliminary work was done. Internode length and plant height were measured in 10 plants at random in pure plots of the following strains: R 26, C.G., D 154, Fanduk, Jap G and Maniksari. The experiment was later on abandoned due to the stunted nature of the crop and will be taken up next season.

Vegetative rapprochement as a means of overcoming interspecific cross incompatibility in jute. Fillippov (1941) working with potato species was able to overcome cross incompatibility by vegetative rapprochement and hybridization.

With a view to overcome interspecific cross incompatibility in jute between *C. capsularis* and *C. olitorius*, vegetative rapprochement by interspecific grafting was started in 1946.

The objects of the work undertaken were the following:—

1. To effect interspecific crossing in jute by successive vegetative rapprochements.
2. To introduce disease resistance and yield capacity of *olitorius* into *capsularis* by successive grafting and budding (if possible).
3. To introduce into *olitorius* capacity to stand water-logged conditions by successive grafting to *capsularis*.

Method of grafting.—Inarch grafting was made and the point of attachment was tied up strongly to make a strong union and covered with cloth and was kept moist by soaking with water. After 15 days cloth and string were removed. On the 20th day the scion was separated from its root and allowed to live on stalk.

From the first generation grafts 5 scion plant seeds were collected from grafts between D 154 (Cap.) and C. G. (Oli), 3 plant seeds were collected from grafts between R 26 (Oli.) and Maniksari (Cap.) and 4 plant seeds were collected from grafts between C. G. (Oli.) and D 154 (Cap.).

Effect of date of sowing on plant growth, flowering and fibre yield.—The experiment had to be abandoned on account of the total failure of the crop.

Varietal differences of fibre content in jute and breeding high fibre-yielding strains.—Considerable difficulties arise in breeding jute for want of a suitable method of estimating small amounts of fibre and testing its qualities. Further complications arise from the fact that both fibre and seed cannot be obtained from the same plant. At the usual harvest stage, the seed is immature and on the other hand plant is too mature for retting and fibre production if the seed is allowed to mature.

In working with fibre percentages in jute with different varieties, want of a suitable method by which fibre percentage could be estimated in part of a living plant was felt.

Ergle and others (1945) working on malvaceous bast fibres were able to develop a suitable method for estimating purified

fibre chemically from the small amount of crude bast of the plants.

The method did not work satisfactorily with jute and suffered from the following disadvantages:—

(*a*) The periderm tenaciously adhered to the finished fibre.

(*b*) The final estimate included foreign material other than fibre.

The finished fibre samples obtained were deep brown in colour, thus, showing that the method was rather drastic for jute.

Certain alterations and modifications were worked out in this laboratory for preparation of purified fibre. The method is being studied in detail and being perfected for rapid and accurate estimations of small amounts of purified fibre in jute.

Jute plants were found to survive and produce healthy seed when about half the crude bast of the whole length of the plant was removed for chemical estimation of fibre.

This method will now be applied to study the following in jute with a view to—

(*a*) Study the fibre content as percentage on green weight and on crude bast of all the genetic strains and other collections and classify them.

(*b*) Isolate plants with high fibre-content by intensive selection work in cultivators' plots and finally purify them.

(*c*) Combine other desirable characters to high fibre content.

(*d*) Study the mode of inheritance of fibre content (per cent) in jute.

Subvention trials.—Three *capsularis* strains *viz*: C 39-212, C 41-13 and C 42 Nj-412 evolved at the Jute Agricultural Research Laboratories were tested out under cultivators' conditions at 94 centres (60 in Bengal, 12 each in Bihar and Orissa and 10 in Assam).

Out of the 94 trials 30 have been reported as failures, due to bad weather condition, damage by cattle, neglect by the grower, etc. The reports from 11 trials have not been received; hence the data is available from only 53 trials out of the 94 laid out. In many of these 53 trials varying plot sizes within a trial were adopted by the staff in charge, on the whole the subvention trials have not been carried out with proper care and attention especially in Bengal.

In the 36 Bengal trials of which the final reports have been received, strain C 39-212 has done the best, having outyielded the control in 21 out of the 36 trials, this strain ranked first in yield at 12 centres. In districts of Jalpaiguri, Tipperah, Pabna and Noakhali this strain has done particularly well, having yielded 43, 23, 22 and 14 per cent better than control respectively.

The new strains have done the best in Assam; strains C 41-13 and C 39-212 having outyielded the control by 30 and 24 per cent respectively. A full report on the trials has been given separately.

III. INHERITANCE OF CHARACTERS

During the year under review good progress was made in the genetical investigations, two studies were completed and the findings were embodied in two papers which have been sent for publication. The investigations carried out at the Jute Agricultural Research Laboratories till now have led to the identification of 16 genes, 3 linkages and location of some genes of 5 out of the 7 possible linkage groups in *C. capsularis*.

Colour.—Further study of the behaviour of the green-light coppery red pigmentation pattern in *C. capsularis* confirmed last year's finding that a member of the anthocyanin allellomorph series was responsible for the production of the pattern and that this new allele was received to the three formerly identified alleles, the allelomorphs are $\underline{A}^{R} - \underline{A}^{L} - \underline{A} - \underline{a}$.

The green-light coppery red type is the least pigmented member of the green-pigmented group. The gene $\underline{a}$ is also characterised by delayed development of pigmentation while the three higher alleles are characterised by non-delayed

development of pigmentation. The delayed development was found to be another of the manifold effects of the anthocyanin allele and the data was interpreted on the basis of allelomorphosim-cum-pleiotropy. The allele a produces no anthocyanin pigmentation on the stem and consequently the type C C a a R R and C C a a r r are phenotypically not distinguishable. With the identification of the allele a, a new full green (c c a a R R) designated full green (7) was isolated.

Bitter taste.—Monogenic inheritance of bitter taste in *capsularis* (Tb – tb) as well as the linkage of this factor pair with branching habit was confirmed.

The factor pair Tb – tb was found to be independent of corolla colour (Py – py), another colour Ay – ay and the pigmentation genes C – C, A^R – A^L – A – a and R-r.

Short branching habit.—Some Chinese types have branches which are only 1 – 3 internodes long while all Indian jutes have long branches consisting of over 3 internodes. From this year's data it would appear that length of branches is controlled by duplicate factors, this finding will be confirmed from the study of the F_3 generation during the coming season.

Cluster habit.—As has been previously reported the Indian jutes are characterised by pods being borne singly or in groups of upto three, most commonly in twos, while in some foreign types the pods are borne in clusters of more than three, usually five and even as many as nine. The F_2 generation of the crosses between cluster and non-cluster types was grown and studied. It was found that a single factor controlled this character, cluster habit being recessive. Selections were made in the F_2 generation to combine the cluster habit with the desirable characters of the Indian parent used (D 154).

Anther colour.—Monogenic inheritance was established for anther colour in *C. capsularis* light yellow anther colour being recessive to yellow anther. This factor pair was found to be completely linked with the factor pair for corolla colour.

Corolla colour.—It will be recalled that the two types of corolla colour found in *C. capsularis i.e.* yellow and pale were controlled by a single factor pair Py – py. In *C. olitorius* the corolla colours found are yellow and light yellow. The light

yellow corolla is extremely rare and so far has been found in only a type obtained from China. All the Indian *olitorius* material examined so far has been found to have yellow corolla. Study of the F^2 generation this year has established a monogenic inheritance of corolla colour in *C. olitorius*, whereas in *C. capsularis* the corolla colour gene is completely linked with the anther colour gene, in *C. olitorius* it appears that the same factor pair probably controls both the corolla colour and the anther colour expression.

IV. CULTIVATION

Line sowing.—To study the economics and outturn of fibre of line versus broadcast sown jute, 5 trials were conducted. Three of these, located at Dacca, Chinsurah and Pabna were for *olitorius* while the remaining two located at Kishoreganj and Rangpur were for *capsularis*.

At Chinsurah, Pabna and Rangpur the post sowing agricultural operations were not carried out according to the instruction given. The trial at Kishoreganj had to be abandoned due to the poor growth of the crop as has been mentioned earlier in the report.

The yield obtained per acre, cost of cultivation and profit with fibre selling at Rs. 25/- per maund are given below :—

C. olitorius trials (Chinsurah Green)

(1) Dacca

Treatment	Cultivation cost per acre		Yield per acre maunds	Profit, value of fibre at 25/- per maund
	Total in rupees	Per cent on control		
Broadcast ...	234·8	100·0	12·0	65·2
No thinning ×·12″	156·5	66·6	11·3	126·0
2″ × 12″ ...	156·0	66·4	12·2	149·0
3″ × 12″ ...	158·3	67·4	11·3	124·2
4″ × 12″ ...	154·6	65·8	11·5	132·9

(2) Chinsurah

Broadcast ...	321·7	100·0	23·5	265·8
No thinning × 12″	249·4	77·5	23·8	345·6
2″ × 12″ ...	266·3	82·7	17·5	171·2
3″ × 12″ ...	260·3	80·9	17·6	179·7
4″ × 12″ ...	256·7	79·7	16·5	155·8

(3) Pabna

Broadcast ...	456·1	100·0	14·6	91·1
No thinning × 12″	344·2	75·4	17·7	98·3
2″ × 12″ ...	342·0	74·9	16·7	75·5
3″ × 12″ ...	353·9	77·5	19·1	123·6
4″ × 12″ ...	354·6	77·7	15·8	40·4

C. capsularis trials (D 154)

(1) Rangpur

Broadcast ...	247·0	100·0	13·7	95·5
No thinning × 12″	202·8	82·1	12·3	104·7
2″ × 12″ ...	194·0	78·5	11·3	88·5
3″ × 12″ ...	181·7	73·5	10·2	73·3
4″ × 12″ ...	174·3	70·5	12·6	140·7

It will be seen that at Dacca and Pabna the yield from the line sown plots is as good or better than the broadcast plot. At Chinsurah, Pabna and Rangpur wheel hoe was not employed for interculture in the line sown plots; otherwise the cost of production would have been further reduced with consequent increase in profit from these plots. At Dacca the line sown plots

have given twice as much or more profit than the broadcast sowings.

Seed rate and harvest stage experiment.—This trial as has already been mentioned earlier in the report had to be abandoned due to poor growth condition of the crop.

Seed jute.—To study the most economical and profitable method of growing jute for seed, two trials were conducted one at Berhampore for *olitorius* and the other located at Rajshahi for *capsularis*. The plots were sown either broadcast or in lines. The broadcast plots were given either light or heavy thinning while in the line sown plots the spacing between plants was kept at 4, 6 and 9 inches and between lines 12 and 15 inches. At these centres unfortunately the cost of cultivation was not kept plotwise nor were the post sowing agricultural operations in the line sown plots done according to instruction. The yield of seed per acre obtained are given below :—

C. olitorius (Chinsurah Green) trial at Berhampore.

Treatment	Seed yield per acre (maunds)	Per cent. on control
Broadcast (Light thinning)	2·8	100·0
Broadcast (heavy thinning)	3·2	114·2
4″ × 12″ linesown	3·4	121·4
6″ × 12″ ,, ...	2·9	103·5
9″ × 12″ ,, ...	2·8	100·0
4″ × 15″ ,, ...	3·2	114·2
6″ × 15″ ,, ...	2·9	103·2
9″ × 15″ ,, ...	2·5	89·2

C. capsularis (D 154) trial at Rajshahi

Treatment	Send yield per acre (maunds)	Per cent. on control
Broadcast (light thinning)	8·2	100·0
Broadcast (heavy thinning)	6·5	79·3
4″ × 12″ linesown	8·0	87·8
6″ × 12″ ,, ...	7 1	86·4
9″ × 12″ ,, ...	7·1	86·4
4″ × 15″ ,, ...	7·9	96·3
6″ × 15″ ,, ...	6·7	81·4
9″ × 15″ ,, ...	7·4	90·7

It will be seen that in the *olitorius* trial all the line sown treatments except two have outyielded the broadcast sown plots. In the *capsularis* the response has not been so favourable. To explore the possibilities of raising a seed jute crop sown in lines and to study its economics more work is necessary.

V. ANATOMICAL AND CYTOLOGICAL INVESTIGATIONS

Structure of the wild species of jute.—As in the previous year, seeds from none of the wild species proved to be viable and as such no anatomical study could be undertaken. Fresh seeds of a number of wild types have been collected from Dacca and elsewhere and will be grown next year for these studies.

Development studies.—With a view to study the cell size in the apical meristem and the development of the vascular elements in detail, material from six different strains was fixed and embedded in paraffin. Microscopic examination of the large number of slides is in progress.

Cytological studies.—The number of haploid chromosomes were found to be 7 in the following types; D 154, R 26 and D 154 x variant n. This has confirmed the findings of previous workers.

Investigation on the chromosome structure of the following 7 types is in progress: Kalichar, Deodhali, Halmahera, Jap G, C. G., R 26 and C. auxillaris.

Studies on the causes of sterility in V^2 *mutant.*—Causes of the sterility of sterile mutant of *C. capsularis*, the morphological details of which have been described by Ghose and Datta (Science and Culture, Vol. X, pp 397-398, 1944-45) is under investigation and preliminary examination shows that in the ovary small protuberances come out of the ovarian wall from the placentas and there is no further growth. None of the stages of the development of the female gametophyte have been observed. Some of the stamens are completely sterile. In the anthers of others viable as well as sterile pollen grains are found. The stages at which sterility starts and the percentage of sterile and fertile pollen are being investigated.

VI. QUALITY OF JUTE

Study of retting technique

Gradual retting.—Experiment on gradual retting was conducted in the controlled retting tanks in October—November, 1946. Out of the 22·5 maunds of Dacca grown C. G. crop harvested on 16th October 1946, 6 lots including the control weighing 3 maunds 30 seers each were steeped separately after treatments mentioned as in table below:—

TABLE III.

Treatments	Date of steeping	Date of extraction	Retting days.	Temp. °C	Yield in lb.	Fibre rate lb. per maund.
Control	16-10-46	11-11-46	26	27·2	17	4·53
Plant stacked on ground for 2 days before steeping	18-10-46	18-11-46	31	26·73	15	4·0
Plants stacked in water upto 26″ for 2 days before steeping ...	18-10-46	18-11-46	31	26·73	16	4·27
Plants stacked on ground for 3 days before steeping ...	19-10-46	12-11-46	24	26·58	17	4·53
Plants stacked in water 26″ for 3 days before steeping	19-10-46	12-11-46	24	26·58	18	4·80
Plants stacked in water 26″ for 4 days before steeping ...	20-10-46	16-11-46	27	27·19	17	4·53

Fibres from each lot have been sent to the Technological Research Laboratories for quality tests and the results are awaited.

Retting after sorting.—In order to effect an even retting, *i.e.*, equal retting of the top and the bottom portions an experiment on retting after sorting was undertaken last year. This year the experiment was further elaborated. In July 1946 Narayanganj grown D 154 crop, bottom portion of which stood for sometime in water was used. Nearly 72 maunds of the crop having varying heights and base diameters were sorted out into 4 different grades. A portion from each of these 4 grades, was cut into top and bottom portions; they were then steeped side by side with the whole plants in separate bundles. The thinnest plants with least variation between top and bottom diameters formed grade 4, and were not cut into two, but steeped as whole plants. The unsorted material forming the control comprised of equal weights of all the 4 sorted out grades mixed together in order to eliminate errors arising from the presence of varying percentages of individual groups in the sample.

Observations.—Daily temperatures of the retting water, period of retting, weight of the fibre obtained for each grade were recorded, while iron, acidity, alkalinity etc. were estimated in the retting water.

Details of the experiment are given in Table IV.

TABLE IV.

Total wt. (md.) steeped	SORTED										UNSORTED		
	Grade 1. Av. P.H.—106. 5 cm. B.D.—2·74 cm.			Grade 2. Av. P.H.—104. 2, B.D.—2·1			Grade 3. Av. P.H.—95·3, B.D.—1·83			Grade 4. P.H.—86·3, B.D.—1.47			
	9·0			18·0			18·0			5·0			
	Whole plant	Top	Bottom	Whole plant	Top	Bottom	Whole plant	Top	Bottom	Whole plant	Whole plant	Top	Bottom
	Md. Sr.	Md. Sr.	Md Sr.	Md. Sr.	Md. Sr.	Md. Sr.	Md. Sr.	Md. Sr.	Md. Sr.	Md. Sr.	Md. Sr.	Md. Sr.	Md. Sr.
Wt. steeped ...	3-0	1-32	4-8	6.20	4-14	7-6	10-0	3-7	4-33	5-0	10-20	3-36	7-14
Wt. of fibre obtained (lb.)	13·5	7·0	12·5	31·0	16·0	44·0	60·0	13·5	34·0	39·0			
Retting days ...	13	12	12	13	12	12	14	9	9	13	14	12	12
Fibre rate lb. per md.	4.5	3·9	3·0	4·8	3 0	3·7	6·0	4·2	7·0	7·8	4·4	3·36	5·03
Fibre p.c.	5·62	4·87	3·75	6·0	3·75	4·63	7·5	5·25	8·75	9·75	5·5	4·2	6·28
Average fibre % (top and bottom) ...		4·0			6·5			7·37				6·0	
Average temp. °C ...	For all the rettings – 31·02												
Date of steeping ...	20-7-46.												

P.H. = Plant height. B.D. = Base diameter.

It will be observed from the above data that there has been no appreciable difference in the period of retting in the different grades of sorted material as also between those and the unsorted material. This year the materials were steeped in July and therefore the retting period has been less. It has been previously found that earlier steepings bring about quicker retting which is mainly due to higher temperature of the retting waters.

In the previous experiment conducted in November-December 1944 whole plants took much longer time to ret than the top and bottom portions and the bottom portions also took longer time than top ones (vide Jute Agricultural Research Laboratories Report, 1945-46, p. 13). This year, the top and bottom portions retted at the same time; while the whole plants had only a slightly longer retting period being only one day more than that of the top and bottom portions in two steepings. On account of the top and bottom portions being retted at the same time, it is expected that there has been even retting in them and therefore the quality ratio is also expected to be good. The Technological Research Laboratories quality ratio figures are awaited with great interest.

A possible explanation of the equal retting of the top and bottom portions this year may be given as follows. The bottom portions of the plants were standing for some time in water, and on account of this there had been possibly an excessive development of loose parenchyma tissue (aerenchyma) in the cortex, less development of periderm and higher moisture content of the tissues. These might have helped in the quicker retting of the bottom portions.

It will be further observed from table IV that the average fibre percentage on green weight in grade I plants is found to be less than in all other grades.

Further work in this line will be carried out next year.

Formation of tannins in jute plant.—After locating tannins in the fibre it was desired to find out stages of its first formation. Tannins were found in jute seeds 5 grams each of air dried jute seeds were soaked in water for 2, 4 and 6 days and tannins were estimated both by Lowenthal and F. D. R. methods. The former was found to be unsatisfactory for the

estimation of lower concentrations of tannin and was, therefore, rejected. The results obtained are given in table V.

TABLE V.

Estimation of tannin by F. D. R. method on 5 gram seed

Seeds	D154		C. G.	
	In light	In darkness	In light	In darkness
Air dry	·0068		·0075	
Soaked for 16 hours ...	·0175	...	·0185	...
2 days ...	·0185	·0397	·0198	·05
4 days ...	·0494	...	·0578	...
6 days ...	·0615	...	·06	...

From the above data it is evident that tannins are initially present in the seeds themselves and are gradually formed along with growth. From the fact that tannins are mostly formed under abnormal conditions, it was expected that more tannins will be formed during growth in darkness than in light. This was corroborated from the two estimations.

Study of fortnightly variation of tannins in D 154 and C. G. plants from the seedlings to the harvest stage.—D 154 and C. G. seeds were sown broadcast, side by side but in separate plots. Samples were drawn every fortnight. During very early stages of the crop whole plants were taken for the estimation. When the separation of the bark from the stick (woody portion) was possible, top and bottom barks and leaves were individually analysed for tannin-contents. The analytical data are given in the tables VI and VII.

TABLE VI.

D. 154 material

Date	% moisture			Tannin per cent (Oven dry basis) Lowenthol			F. D R.		
	Bark		Leaf	Bark		Leaf	Bark		Leaf
	Top	Bottom		Top	Bottom		Top	Bottom	
7 days Old									
3-6-'46 ...	88·73		84·02	...		...	0·89		1·69
17-6-'46 ...	87·75		74·81	...		...	2·25		3·81
1-7-'46 ...	74·32	76·32	69·5	0·47	0·97	0·72	1·44	2·40	3·34
15-7-'46 ...	76·38	79·08	71·11	0·39	0·86	0·90	3·09	4·44	4·22
29-7-'46 ...	74·79	77·03	73·47	0·52	0·78	1·81	2·06	3·87	5·16
12-8-'46 ...	72·22	75·75	71·75	0·79	1·07	2·48	2·84	4·41	6·08
26-8-'46 ...	72·10	74·70	69·89	0·79	1·03	2·62	3·26	3·71	6·04
9-9-'46 ...	70·38	73·4	70·16	0·74	0·98	2·34	2·87	3·31	6·03
23-9-'46 ...	62·67	71·36	67·27	0·70	0·91	2·81	2·97	3·87	5·87

TABLE VII.

C. G. material

7 days Old									
3 0-5-'46 ...	92·55		86 98	...		...	2·28		2·53
13-6-'46 ...	87·96		80·34	0·55		0·45	3·32		4·42
27-6-'46 ...	76·49	77 90	71·36	0·74	3 03	0 77	1·82	4·57	4 00
11-7-'46 ...	76·49	75·53	73·49	1·31	3·43	1·51	2·76	6·54	6·60
25-7-'46 ...	75·39	73·75	73·95	1·42	2·66	1·34	3·65	5·30	5·33
8-8-'46 ...	70·40	72 90	70·75	1·32	2·44	1·20	3·14	4·80	5·16
22-8-'46 ...	68·00	70·65	65·16	1·50	2·08	1·52	3·13	4·53	4·76
5-9-'46 ...	67·29	69·06	63·63	1·74	2·26	1·92	3·40	4·98	5·72
19-9-'46 ...	65·18	67·50	67·62	1·78	3·35	1·76	3·88	6·83	7·35

It will be observed from the above data that both in D 154 and C. G. there is a general tendency for the moisture in the leaf as well as in the bark, to decrease from initial higher value in the early succulent stage, to a lower one in the harvest stage. Generally, tannins in the C. G. type have been found to be more than that in D 154, both in bottom and top barks as well as in the leaf.

VII. BIOCHEMICAL STUDIES

Chemical and Bacterial changes during retting

A detailed study in the biochemical decomposition of jute plants during the process of retting has been made in order to verify the results obtained last year.

200 *olitorius* plants of the same maturity were harvested from the same field. Each plant was cut at 1 metre and 38 cm length rejecting nearly 6″ from the top; the leaves and branches were also excluded from the sample. Before actual steeping three random samples and one sample of minimum base diameter were taken out. Each sample consisted of five plants. The rest of the 180 plants were then steeped in the controlled retting tank. Subsequently two samples each consisting of five plants were drawn at random at the close of every week. Thus, in all eight samples during the period of retting were drawn from amongst the 180 plants steeped.

The individual sample was chemically analysed for (1) total dry matter, (2) ash content, (3) Nitrogen, (4) furfural, (5) Lignin and (6) pectin matters while the retting water was analysed for acidity, alkalinity, dissolved oxygen, etc.

Bacterial counts were taken, as in the last year, both on the jute fibre as well as in retting water. Besides, estimation of lignin, pectin as well as dissolved oxygen have, in addition, been taken up this year.

The results of analyses are given in table VIII.

TABLE VIII

Olitorius material (Plants B. D. 1·25 ± 0·05 cm)

—	Bacterial counts per c.c. of retting water.	Bacterial counts per gm. of oven dry retted fibre.	Retting water.			Total dry matter (gms)	Ash on oven dry basis (gms)		Nitrogen on oven dry basis		Furfural on oven dry basis (gm)		Lignin on oven dry basis (gm)		Pectin as Ca-pectate on oven dry basis (gms)		Temp. °c Weekly mean (°c)
			Dissolved Oxygen p. p. m.	Acidity p. p. m	Alkalinity p. p. m.		Per cent	On total dry matter	Per cent	On total dry matter	Per cent	On total dry matter	Per cent	On total dry matter	Per cent	On total dry matter	
Control ...	3,45,000	...	4·01	...	...	45·66	3·81	1·74	0·260	0·119	9·166	4·185	14·12	6·447	6·0	2·74	28·3
						47·85	4·02	1·92	0·243	0·116	9·790	4·684	14·18	6·785	6·0	2·87	
						47·06	3·63	1·71	0·232	0·110	9·716	4·572	14·35	6·753	5·15	2·42	
						*43·64	4·07	1·77	0·283	0·123	8·853	3·863	14·28	6·232	6·5	2·84	
End of 1st week ...	1,07,312	34,042	0·06	148	-9·6	42·91	2·55	1·09	0·278	0·119	9·808	4·209	14·10	6·050	5·4	2·31	26·4
						42·56	2·45	1·04	0·303	0·129	9·928	4·225	13·24	5·634	3·20	1·36	
,, 2nd week	3,812	19,37,500	0·86	270	+11	34·64	1·77	0·61	0·321	0·111	8·861	3·069	15·37	5·324	3·3	1·14	26·4
						35·47	2·07	0·74	0·325	0·115	8·935	3·170	16·03	5·686	4·16	1·47	
,, 3rd week	18,812	80,80,357	2·79	140	109	33·93	1·35	0·46	0 250	0·085	9·088	3·083	15·00	5·089	2·4	0·81	25·6
,, 4th week	22,500	...	2·74	120	126	32·55	1·17	0·38	0·262	0·085	9·074	2·953	13·20	4·296	2·2	0·72	24·0
						31·80	1·43	0·46	0·324	0·096	8·591	2·732	13·02	4·140	2·2	0·70	

*The sample consisting of five plants of minimum base diameter.

Conclusions.—As it was found last year both dry matter, ash as well as furfural tend to diminish gradually. Nitrogen tends to remain nearly the same while it declines towards the end of the retting period namely in the alkaline phase of the process, wherein, as expected, lignin also shows a sharp decline. Whereas, from the start to the end pectin matters show a gradual decrease. The bacterial counts are in accordance with the last year's findings *i.e.* after a decrease, the bacterial count increases again. This fluctuation of bacterial number most strikingly synchronises with that of dissolved oxygen. This apparently can be explained in the light of former findings that acid phase which is first to set in helps to expel the dissolved oxygen partly by physical expulsion along with the evolution of the CO_2 and partly by bacterial consumption.

SOIL

The study of nitrogen transformation in jute soils and its utilisation by jute plants as well as microbial changes taking place in the soil during the culture of jute in the season was undertaken. Two contiguous plots (12 yds. × 12 yds) in South Moster Tek, under same conditions and treatments were chosen, in one of which jute was grown while the other was left fallow. Preparatory cultivations as well as liming etc. and post sowing operations, e.g., thinning, weeding, etc. as well as drainage were the same for both the plots. D 154 seeds were sown on 24th May, 1946. Post sowing soil samples were drawn regularly every fortnight, pre-sowing sample being drawn on the 24th May which was the control.

All the samples were analysed for H_2O, NH_3, NO_3 in situ while N_2 was estimated on the air dry soil.

Bacterial and fungal counts were also taken for each sample.

The data of the analyses are detailed in table IX.

TABLE IX.

Date	Un-cropped. P. C. of moisture	NH_3-N p. p. m.	NO_3-N p. p. m.	Nitrogen per cent	Bact. counts per gm of Soil × 250,000	Fungal counts per gm. of soil × 2,500.	Cropped. P. C. of moisture.	NH_3—N p.p.m.	NO_3—N p.p.m	Nitrogen per cent.	Bact. counts per gm. of Soil × 250,000	Fungal counts per gm. of soil × 2,500
24-5-46. (control)	14·82	*trace	7·23	0·081	28·17	49·77	15·25	*trace	9·25	0·084	27·14	35·4
9-6-46	18·38	*trace	6·90	0·081	38·22	33·08	17·60	4·48	8·16	0·0846	43·68	35·8
24-6-46	15·28	6·94	8·42	0·082	45·80	66·60	14·75	5·09	7·88	0·0855	64·05	74·37
9-7-46	17·98	6·48	8·70	0·080	35·11	35·11	19·07	6·57	6·57	0·083	67·34	28·91
24-7-46	17·18	6·76	9·46	0·079	57·91	106·49	18·24	6·67	7·02	0·0839	30·58	83·66
9-8-46	18·58	5·85	11·52	0·079	54·53	32·18	18·48	5·84	8·76	0·083	53·73	17·17
24-8-46	18·64	7·91	13·08	0·069	70·06	47·25	17·34	6·77	9·48	0·072	54·20	32·18
9-9-46	14·63	7·54	11·13	0·069	28·35	41·70	15·17	5·28	6·60	0·068	43·85	45·03
24-9-46	13·49	7·60	10·68	0·073	58·26	46·24	10·81	6·28	8·80	0·073	48·21	55·72

All the results are calculated on oven dry basis.

General observations.—The usual trend of the various changes, e.g., NH_3, NO_3, moisture, bacterial and fungal numbers, etc. have been noted. From one year's findings it is not safe to come to any definite conclusions. From the observed data, however, it is evident that the trend of the variation in fungal counts has been found to vary inversely with that of the moisture content both in the cropped and un-cropped fields whereas bacterial number cannot be said to be influenced in a similar way. Whether the variation in bacterial number has any direct bearing with moisture content or temperature could not be ascertained for want of necessary apparatus, e.g., soil thermometer, etc.

It is interesting to note the changes in NH_3 & NO_3 taking place in the soil both in the cropped and uncropped fields. In general the ammonia status of the soils remains nearly the same but due to nitrification NO_3 is gradually formed and gets accumulated which, all other conditions in both the plots being equal is gradually removed by the growing plants in the cropped plots. Therefore more accumulation of NO_3 is seen in the uncropped field.

In order to corroborate these findings more elaborate experiments will be taken up this year.

VIII. DISEASE

Stem-rot caused by Macrophomina Phaseoli

Study of the fungus.—Altogether 60 type cultures are being maintained. In connection with our study of physiological races, cultures of *M. Phaseoli* from U. S. A. and Canada and of *Rhizoctonia bataticola* from Palestine have been obtained.

Control of the Disease

Primary infection—Seed treatment.—(*i*) In a series of test carried out with different commercial dusts for determining their fungistatic action the following results were obtained.

TABLE X

Chemicals	Quantity of seeds	Quantity of chemicals	Duration in minute	Mean G. P.	Mean D. P.
Granosan	50 grammes	0·5 grammes	1·0	81·1	2·5
Granosan	25 ,,	0·5 ,,	1·0	80·0	0·4
Granosan	25 ,,	0·5 ,,	3·0	78·0	0·1
Granosan	25 ,,	0·5 ,,	10·0	78·3	0·0
Arasan	70 ,,	0·5 ,,	0·5	77·3	2·8
Arasan	35 ,,	0·5 ,,	0·5	81·0	1·3
Arasan	35 ,,	0·5 ,,	1·5	79·0	0·9
Arasan	35 ,,	0.5 ,,	5·0	81·2	1·3
Agrosan-G	10 ,,	1·0 ,,	2 0	80·1	1·0
Agrosan-G	10 ,,	1·0 ,,	10·0	71·5	0·0
Agrosan-G	10 ,,	1·0 ,,	15·0	78·8	0·4
Nomersan	10 ,,	1·0 ,,	2·0	79·5	2·6
Nomersan	10 ,,	1·0 ,,	10·0	77·7	0·9
Nomersan	10 ,,	1·0 ,,	15·0	76·9	1·5
Without treatment (control)				68·7	17·2
C. D.	...	...	...	32·13	

G. P. = Germination per cent. D. P. = Disease per cent.

(*ii*) For large scale treatment of seed a rotating seed-mixer was used and the exact quantity of dust (in this case Agrosan-G) required for good covering for a given volume of seed was determined. Results are tabled below. The seeds were first winnowed and then treated with forty rotations covering a minute in each feed.

TABLE XI.

Variety	Quantity of seed	Sources of seed	Agrosan—G used
D 154	14 seers	Dacca Farm	20·3 Tolas
,,	,,	,,	21·0 ,,
,,	,,	,,	20·6 ,,
,,	,,	Narsingdi Substation	24·9 ,,
,,	,,	,,	24·3 ,,
,,	,,	,,	25·5 ,,
,,	,,	A. L. Godden	22·6 ,,
,,	,,	,,	23·0 ,,
,,	,,	,,	23·2 ,,

Thus according to the quality of seeds 20 to 25 tolas (8 – 10 ounces) of Agrosan-G give good covering for fourteen seers of *capsularis* seed. Clean and smooth surfaced seeds require lesser quantity of dusts.

(*iii*) Storage of seeds.—In continuation of our experiment started in October 1945 (*vide* Annual Report 1945-46) the fourth test of the samples was made in December 1946 after more than a year's storing. The results are tabled on next page :—

TABLE XII.

Results of tests carried in December 1946.

Tests carried at an uniform temperature of 33° ± 0·5°

Treatments.	G. P.	D. P.	Moisture percentages as calculated at the start of experiment.
Sunning for 0 hours	0·0	*	21·25
24 ,,	63·0	19·5	Not estimated
72 ,,	70·0	15·4	8·76
96 ,,	65·0	21·0	7·54
120 ,,	88·0	2·8	Not estimated
144 ,,	87·5	2·3	,,
168 ,,	91·5	3·2	2·88
Agrosan-G × 0 hrs. sunning	0·0	*	
,, × 24 ,, ,,	50·0	1·0	
,, × 72 ,, ,,	54·0	Nil	
,, × 96 ,, ,,	71·0	0·8	
,, × 120 ,, ,,	76·0	Nil	
,, × 144 ,, ,,	79·5	Nil	
,, × 168 ,, ,,	82·5	Nil	
Granosan × 0 hrs. sunning	0·0	*	
,, × 24 ,, ,,	84·5	0·6	
,, × 72 ,, ,,	85·0	Nil	
,, × 96 ,, ,,	83·0	Nil	
,, × 120 ,, ,,	89·5	Nil	
,, × 144 ,, ,,	90·5	Nil	
,, × 168 ,, ,,	9·00	Nil	

* In all these cases bacterial growth suppressed the growth of the fungus.

It appears from the table that (1) At least 96 hours sunning is essential for good storing of seeds for a long period.

(2) Seeds containing higher percentage of moisture lose viability to a great extent. Higher percentage of moisture helps the fungus to remain viable in the seed.

(3) Seeds which are stored immediately after harvest lose viability completely (after a period of storing for more than 12 months).

(4) Treatment with Agrosan—G or Granosan after sunning gives additional protection against the injury caused by the fungus.

(5) Seeds must be stored in non-porous air tight containers only, specially when long storing is in view.

(6) Properly sunned and treated seeds can be effectively stored for more than one year.

Analysis of seed samples from Districts.—Samples of seeds are being collected from all the jute growing tracts of Bengal and are being analysed. The percentage of germination, diseased seeds, and other characters are being recorded. So far one hundred and fifty two samples have been received and nearly fifty have already been analysed.

Effect of sprays against secondary infection.—For want of proper facilities separate (independent) trials with sprays could not be conducted. But effect of sprays was tested against *olitorius* crops in three replicated trials conducted for yield.

Bordeaux mixture was used in the strength of 4:4:50 with rosinsoda as sticker. Under laboratory condition it prevented germination of pycnospores sprayed on leaves.

It was found that the sticker could stand intermittant rains of 0.3, 0.0, 1.3, 0.26 inches in four days. The strength used was not injurious to leaves or leaf-buds. It failed to check spread of lesion which already travelled from leaf to stem; but preventive sprays on the foliage of a crop in another trial kept it comparatively free from disease.

Perenox in the strength of approximately ·25% was used against *olitorius* seed crop. This strength was non-injurious to foliage. The crop remained healthy up till harvest.

Manurial trials.—Single and treble doses of Ammonium sulphate—(N_1 = single dose @ 1·8 maunds per acre) and Muriate of potash—(K_1 = single dose @ 0·6 maunds per acre) in several combinations were tried as in previous year both at Kishoreganj and Dacca. At Kishoreganj, the crop was practically disease free. The experiment had four replications one of which was rejected due to inundation and consequent poor

growth. The yield data at Kishoreganj based on three replications are given below:—

TABLE XIII.

D 154				C. G.		
Sl. No.	Treatment	Yield per acre in maunds	% on control	Treatment	Yield per acre in maunds	% on control
1	N_2K_2	18·65	286·9	N_3K_2	19·65	633·8
2	N_3K_2	17·44	268·3	N_1K_2	15·03	484·8
3	N_3K_1	16·23	249·6	N_3K_3	14·86	479·3
4	N_3K_3	14·97	230·3	N_3K_1	14·66	472·9
5	N_2K_1	14·43	222·0	N_2K_3	14·47	466·7
6	N_2K_3	13·43	206·6	N_2K_1	13·51	435·8
7	N_3	12·53	192·7	N_3	13·46	434·1
8	N_1K_2	11·04	169·8	N_1K_1	12·05	388·7
9	N_1K_1	10 15	156·1	N_1K_3	11·10	358·0
10	N_1	9·19	141·3	N_2	10·47	337·7
11	N_2	8·86	136·2	N_2K_2	9·17	295·8
12	N_1K_3	7·25	111·5	N_1	8·36	269·6
13	F. Y. M. (control)	6·49	100·0	K_2	6·38	205·8
14	K_2	6·26	96·3	K_3	5·49	177·0
15	K_3	5·63	86·6	K_1	4·53	146·1
16	K_1	5·36	82·4	F. Y. M. (control)	3·07	100·0

As to the effect of fertilizers on the incidence of stem-rot and root-rot, data recorded at Dacca are given below:—

TABLE XIV.

D 154			C. G.		
Treatment	Per cent disease	Per cent on control	Treatment	Per cent Disease	Per cent on control
N_3K_3 ...	12·0	31·7	N_1K_3 ...	11·7	27·0
K_3 ...	13·6	35·9	K_3 ...	11·8	27·3
N_1K_3 ...	13·6	35·9	K_2 ...	14·9	34·4
N_1K_2 ...	16·8	44·3	N_3K_3 ...	16·0	37·0
N_2K_2 ...	18·6	49·1	N_3K_2 ...	18·1	41·8
K_1 ...	19·9	52·5	K_1 ...	18·4	42·5
N_2K_3 ...	22·9	60·4	N_2K_2 ...	19·3	44·6
K_2 ...	23·7	62·5	N_2K_3 ...	21·7	50·1
N_2 ...	32·0	84·4	N_1K_2 ...	26·8	61·9
N_3K_2 ...	34·1	90·0	N_3K_1 ...	30·4	70·2
N_3K_1 ...	34·8	91·8	N_2K_1 ...	31·5	72·7
N_1 ...	35·5	93·7	N_1 ...	32·6	75·3
N_1K_1 ...	36·3	95·8	N_2 ...	35·2	81·3
F. Y. M. ...	37·9	100·0	N_1K_1 ...	36·7	84·8
N_3 ...	39·3	103·7	N_3 ...	39·0	90·1
N_2K_1 ...	50·8	134·0	F. Y. M. ...	43·3	100·0
C. D. ...	19·34	...	C. D. ...	19·34	...

From the above table the action of muriate of potash is seen to be effectively helping the crop to either survive or escape

attack to a considerable degree. Whether this fertilizer has any direct fungistatic action or helps the crop by way of special nutrition, is not yet known.

IX. PESTS

The attack of the jute semilooper and yellow mite was very serious this year in most of the important experiments and had to be controlled as per recommendations.

The Yellow mite (Tarsonemus latus Banks)

Nature of damage.—The young leaves which are still folded are attacked on the under surface. The damage is caused by the nymphs as well as by the adults which suck up the sap of the leaves by making small punctures. By repeated punctures and loss of sap, the leaves crinkle and curl down. The superfluous fluid which oozes out as a result of punctures and sucking of the sap, hardens on exposure and renders the leaves crisp. Sometimes, abscess-like swellings are developed on the leaves.

The attacked leaves do not grow to normal size, turn coppery green and drop off prematurely. The internodes at the affected places shorten and the plants put forth the enormous side branches. The growth of the plants is very much checked.

Life-history.—The male emerges earlier than the females. On emergence, it moves about in search of quiescent females and on locating one it uses the tip of the abdomen to lift her and carries her until she is ready to emerge, when the latter holds fast the leaf surface with the legs and final moulting takes place. The male then turns back and copulates. The males are polygamous in habit and always move about in search of quiescent females. Very often more than one males are seen to follow another male carrying a quiescent female and try to snatch her away when a tussle follows; and one who succeeds, carries her away.

The pre-oviposition period is very short and is 16 – 30 hours. The eggs are deposited singly in the shallow depressions along the mid-rib or between the veinlets of the folded leaves. The oviposition record was maintained in 12 cases, but it was not possible to get the full record in most cases, as the female was either lost during transfer to healthy plant or found

missing from the plant. However, the total number of eggs laid by a female was 57 during an oviposition period of 12 days. The female dies after depositing the last egg.

The egg hatches in 27—32 hours in October and November. The young nymph comes out through a slit at the side of the chorion which remains there unless mutilated by the trampling of the nymphs and adults. The nymphal stage lasts only a day and a half, of which the active period covers about a day and quiescent stage 6—8 hours. The males emerge 3—6 hours earlier than the females.

The whole life-cycle occupies $2\frac{1}{4}$ days in case of male and $2\frac{1}{2}$ days in female.

Control measures.—Lime-sulphur in the proportion of 3:1 as dust was found very effective and was recommended for controlling the mite, but it requires a day to have the full-effect on the nymph and adult. As such there is risk of chemicals being washed off during rains. It was, therefore, necessary to find out some insecticides which might have speedy action on the mite. Various insecticides in different proportions and dilutions were tried as sprays and their effect on the foliage and stages of the mite was studied. The best result was obtained with rosin-fish-oil soap solution as spray, followed by lime-sulphur dusting. The eggs mostly remained unaffected and second treatment was necessary on the following day when all the eggs had hatched.

Ferrisia virgata Ckll.

It is a common mealy bug and has been recorded in India on a number of host plants. It has been recorded for the first time as occurring on jute (*olitorius*) in the Dacca Farm and neighbouring places.

Nature of damage.—The damage is mostly caused by the nymphs which usually remain congregated around the mother and suck up the sap of the stems, pods, leaves and petioles. The adult female feeds until it starts ovipositing. Repeated damage at about the same place develops a crust on the stem due to which fibre bundles resist separation at the time of retting, resulting in the formation of barky fibre. The affected plants do not put forth the usual number of pods. The infested

pods do not grow to normal size, become deformed and remain abortive.

Life-history.—The eggs are laid in advanced stage of development and hatch in 19—29 minutes after deposition. The maximum number of eggs laid by a female during an oviposition period of 16 days was 955, with an average of 657 eggs for 12 females. The highest number of eggs laid by a female in a day was 261. There are three nymphal instars in the female and four in the male. In the first and second stadia, the sexes are indistinguishable. The differentiation is marked towards the end of second stadium when the male nymph starts covering its body with the flossy hairs. Inside the floss, it moults thrice and finally emerges as an adult. The nymphal stage in both sexes occupies 16—22 days during October and November.

The adults of both sexes differ greatly, the male being winged and smaller in size. The body of the female is oval in shape, flattened dorso-ventrally and covered with white meal and cottony hairs. The antenna consists of eight segments. The eyes are simple. The tarsus is one segmented and is furnished with a single claw, from the base of which arise two clubbed processes. The anal lobes are small and round, each bearing a long white filament which encloses two long setae for its support. The male is smaller and has an elongated form. The forewings are large with greatly reduced venation. The hind wings are represented by a pair of slender processes, each furnished with a bristle which fits into the pocket on the margin of the wing. The antennae are long and 10 jointed. There is on each side of the head a very small eye, the primary eyes. In addition there are two pairs of eyes, one pair on the dorsal aspect and the other on the ventral.

Control.—Various insecticides were tried in different proportions and dilutions as sprays for controlling *Ferrisia virgata* and the best result was obtained with nicotine sulphate solution (1 part of nicotine sulphate in 125 parts of water). Further study is necessary.

Jute Buprestid (*Trachys pacifica* Kerr)

The life history of the jute Buprestid has already been studied. Experiments were carried out with various insecticides

in the laboratory for controlling the pest but it presented a difficult problem to deal with the pest, as the adults do little damage and the immature stages remain more or less protected. However, very good result was obtained against eggs and young larvae with nicotine sulphate in combination with soft soap solution as spray.

Pests and diseases control Scheme at Narsingdi

The pest and disease control scheme on a 'pilot-plant' scale was started in the year 1943 for trying out various control methods for pests and diseases under cultivators' conditions. The scheme has completed the fourth year of its activities. During this period most of the results achieved in the laboratories have been successful in large scale trials. The results have been finally recommended to the cultivators. Cultivators now appreciate the value of adopting prophylactic measures as recommended by us. This we had to convince them through demonstrations of practical results. There has been a big demand from cultivators outside the scheme to be also included.

The total area under investigation this year was 49·65 acres of which 17·81 acres (*Capsularis*—9·60 acres and *Olitorius*—8·21 acres) covered the untreated plots and 31·84 acres (*Capsularis*—14·75 acres and *Olitorius*—17·09 acres) covered the treated plots.

As usual preparatory operations were supervised. Special attention was paid to the removal of all stubbles from the fields.

Capsularis crop was sown by the middle of March and *Olitorius* in April. Prior to sowing seeds for all the treated plots in the area were treated with Agrosan-G.

The demonstrator visited each plot every alternate day and adopted control measures wherever necessary. To control the attack of jute semilooper bamboo perches were erected and necessary insecticidal control and other measures were adopted.

The effects of control measures on yield for the last three years is given below in a tabular form.

TABLE XV

Year	Treated or Untreated	Capsularis		Olitorius	
		Total area (acres)	Average yield per acre	Total area (acres)	Average yield per acre
			Md. Sr. Ch.		Md. Sr. Ch.
1944	Treated	4·57	19 7 0	15·12	23 12 0
	Untreated	8·13	16 9 0	6·74	18 32 0
1945	Treated	14·43	15 3 0	16·45	25 14 0
	Untreated	7·55	15 5 0	7·18	19 2 0
1946	Treated	14·75	16 4 0	17·09	22 36 0
	Untreated	9·60	15 8 0	8·21	18 39 0

In all the three years the treated plots show better yield. Only in the year 1945 the treated *Capsularis* plots failed to respond to the expectation.

Cost of seed treatment for the last three years is as follows :—

Year	Area under treated seed in acres.	Quantity of chemical (Agrosan-G) in lbs.	Total cost approximate Rs. As P.	Cost per acre.
1945	19·69	3 5	5 9 0	Less than 5 annas
1945	30·88	5·0	7 14 0	Slightly more than 4 annas
1946	31·84	5·0	7 14 0	Do. Do.

In spraying a 'Primus' sprayer, which requires two men to operate, was used. Spraying operations were taken up

wherever chance of epidemic was suspected. These were conducted with the help of hired labour, which interferes with the progress. If a team of trained workers are appointed permanently, then more efficient work can be had at a less cost.

Indigo as a trap crop for controlling *Laphygma exigua* was found ineffective, as the pest prefers jute to indigo. Paris green and Lead arsenate were used as dust against this pest with successful results. All other pests were dealt with as recommended.

Economic of pest and disease control.—

Cost of seed-treatment, spraying, dusting, perching, hand-picking, etc.

Chemicals.	Cost.
1. Insecticides and fungicides ...	... Rs. 73-14-0
2. Perching	... ,, 40 -0-0
3. Labour	... ,, 57- 4-9
	Total Rs. 171- 2-9

Profit (*Capsularis* and *Olitorius* combined)

——	Total area (acres)	Average yield per acre Md. Sr.	Increase in yield per acre Md. Sr.	Value @ 2 /- per md. Rs. As. P.	Cost of control per acre Rs. As. P.
Treated ...	31·84	19 20	2 16½	48 4 0	5 4 0
Untreated ...	17·65	17 3½	...	...	...
Increased profit per acre—Rs.			43 0 0		

X. MISCELLANEOUS

Since June 1946 there had been frequent outbreaks of communal riots in Dacca. Due to the disturbed conditions there had been considerable dislocation and disarrangement of work. On some days members of the staff living in the town could not

at all come to work. In spite of these handicaps all the attempts were made to carry on with the programme of work.

Mr. A. T. Sanyal, Scientific Assistant was appointed Superintendent of the Mymensingh Outstation with effect from the 14th September 1946, but he remained attached to the Dacca Laboratories as the Outstation had not opened.

Mr. S. Chakravarty, Junior Chemical Assistant left us on the 26th November, 1946 to join the Dacca University as a post-graduate student. Thereafter his post remained vacant.

Mv. Md. Aslam, Agricultural Overseer, Sarisabari was transferred from this department on 30th December 1946. Since then the post remained vacant.

Outstations

Land for Outstations at Mymensingh, Jessore and Rangpur has been selected and is being acquired with the help of the Government of Bengal.

Publications

The following is a list of publications prepared by the Jute Agricultural Research Laboratories :—

1. Das, G. M. (1947)—*Ferrisia virgata* Ckll (Coccidae), a new pest of jute (*Corchorus olitorius*) in Bengal. Science and Culture, Vol. 12.
2. Das, G. M.—Biology of *Euplectrus gopimohani* Mani, a larvae parasite of *Laphygma exigua* Hbn. (Sent for publication).
3. Ghose, R. L. M., Rao, K. R. and Ghosh, S.—The Genetics of *Corchorus* (jute) IV. Inheritance of two new anthocyanin pigmentation patterns (sent for publication).
4. Ghose, R. L. M., Rao, K. R. and Kundu, B. C.—The Genetics of *Corchorus* (jute) V. The inheritance and linkage relations of bitter taste, anther and corolla colour (sent for publication).
5. Kundu, B. C. (1947)—*Abroma auguste*, a neglected fibre plant of India. Proceedings of the Indian Science Congress, 1947.

Training

In a meeting of the Special Utilisaiton Sub-Committee held on the 28th February, 1945 the Agricultural Research Sectional Sub-Committee recommended that the District Agricultural Officers should receive a short training on the methods of controlling diseases and pests at the Committee's Farm. It was later on decided at the suggestion of the Director of Agriculture, Bengal that the Entomologists and Mycologists under the different Deputy Directors should receive training and on return from this training they would organise the training of the District Agricultural Staff in their own circles.

Nine members of the staff of the Entomological and Mycological sections of the Bengal Agricultural Department received a short course of training at the Committee's Farm on 4th and 5th June, 1946.

They were shown the different stages of the pests and diseases of jute, and the nature of damage caused by them and their methods of control both in the laboratory and in the fields.

They also visited the pests and disease control station at Narsingdi, where the control operations of pests and diseases of jute were being carried out on a large scale under cultivators' conditions.

सत्यमेव जयते

B. C. KUNDU

Director, Jute Agricultural Research

APPENDIX.

Programme and progress of work

Programme of work as sanctioned. (1)	Progress made (2)	Nature of future work (3)
1. Collection of varieties and types.	26 *Capsularis* and 36 *Olitorius* types were collected from Faridpur and 24 pargana districts. 2 *Capsularis* and one *Olitorius* types were received from abroad. These were grown and studied.	Collection of samples from unrepresented areas and their study. Maintenance of collection.
2. Breeding of improved strains of jute.	62 breeding trials were conducted, cultures were studied for various characters and promising ones were carried over for further work. 3 *Olitorius* strains which are better in yield and quality than Chinsurah Green were promoted to the multiplication stage with a view to test their performance under cultivators' conditions at various centres in the jute growing provinces. 3rd mating in connection with the compound crossing programme was completed and 550 crossed pods were obtained.	Further study and testing of the material in hand.

Polyploidy and interspecific hybridization in jute.	D 154 and C. G. seeds were treated with O. 1% colchicine. No plants showed any morpholigical characters indicating polyploidy.	Further colchicine treatments will be carried on. Interspecific crossing will be attempted if polyploidy are obtained.
Internode length and its correlation with ultimate fibre length.	Abandoned due to unsatisfactory crop.	As in column 1.
Vegetative rapprochement as a means of overcoming inter specific cross incompatibility in jute.	1st generation interspecific vegetative graftings between *Capsularis and Olitorius* species were made and seeds from the scions collected.	Seeds from 1st generation grafts will be grown and further successive interspecific graftings will be done.
Effect of date of sowing plant on growth flowering and fibre yield.	Abandoned due to failure of the crop.	As in column 1.
Varietal differences of fibre content in jute and breeding high fibre-yielding strains.	A chemical method of estimating small amounts of purified fibre from about half the crude bast of the whole length of a standing plant was worked out. The plants ($\frac{1}{2}$ crude bast removed) were found to produce healthy seed.	As in column 1.
3. Mode of inheritance of characters.	Inheritance and linkage relations of bitter taste, anther colour and corolla colour was investigated as well as the mode of inheritance of cluster habit and length of branches.	Study of the F 1 and F 2 and Backcross generation of various characters under investigation.

Programme of work as sanctioned (1)	Progress made (2)	Nature of future work (3)
4. Survey of prevailing retting methods and condition in Bengal.	.....	As in column 1.
5. Investigations on retting technique.	Various methods were tried (1) Gradual retting (2) Retting after sorting. Formation of tannin and Variation of tannin from seedling to harvest stage.	Study of the retting methods as in (2). (1) Retting of the normally grown crop as against the waterlogged one. (2) Retting of border jute as against the interior crop.
Biochemical studies of (1) the retted jute (2) retting water and (3) soil.	(1) Bacterial changes in retted jute and retting water studied (2) Biochemical changes in retted jute, e. g., nitrogen lignin, furfural pectin etc. were studied (3) Nitrogen transformation in soil has been done.	(1) Variation, if any, in the number of different physiological groups of bacteria in retting (2) Isolation of Bacteria, (3) study of the particular types of bacteria in retting (4) study of nitrifying and nitrogen fixing capacity of bacteria in jute soils (5) Item (3) in column 2 to be studied again.

6. Formation of fibre.	For study of the development of vascular elements and the study of the cell size in apical meristern material was fixed and embedded in paraffin. The microscopical study is in progress.	The study will be continued.
7. Influence of seed rate, stage of harvest and duration of retting period on yield and quality.	The experiment had to be abandoned due to poor growth condition.	The study will be continued with the modification in the experiment suggested by the Director, Technological Research Laboratories.
8. The possibility of line sowing of jute.	Trials at 5 centres in Bengal were conducted. Line sowing of jute proved to be more economical and profitable.	The study will be continued.
9. Spacing and manurial requirements of seed jute.	Trials at two centres in Bengal, were conducted, *Olitorius* crop responded well to line sown and in most of the spacing treatment gave better yield than the broadcast sowings, the response in *Capsularis* was not so favourable.	This study will be continued.
10. The study of the effect of climate and environmental conditions on the incidence of disease.	Early sowings were generally better than late sowings. *Olitorius* crop was found equally susceptible to stem-rot in certain experiments as *capsularis*.	Study of effect of environmental factors on secondary infection.

Programme of work as sanctioned (1)	Progress made (2)	Nature of future work (3)
11. Study of the stem-rot fungus.	Cultures of Macrophomina Phaseoli were obtained from U. S. A. and Canada and that of Rhizoctonia bataticota from Palestine for comparative study. 29 Selections were made from last year trials. 20 primary selections were made.	Comparative study of the collected type cultures. Study of epidemiology of the stem-rot disease in the field. Selection of stem-rot resistant types.
12. Investigation on the control of stem-rot and root-rot disease.	Comparative strength of various seed dressing compounds were assessed. It was found that successful long storage depends on proper sunning low and moisture content of the seeds. Treated seeds can be stored. Perenox and Bordeuax (4:4:50) proved successful to some degree in checking leaf infection. Treble dose of N gave more yield than double dose. When combined with K1 incidence of stem-rot and root-rot was low.	Problems of seed treatment and storage. Effect of varius sprays on the secondary infection of leaves. Manurial trials.
13. Investigations on the control measures of Jute Apion.	Selection of types resistant to Apion attack.	Selection to be continued. Biology and control of Phenacoccus sp. Further experiments for controlling white-mite are to be made.

13.—*Contd.*	.....	Further experiments on insecticides are to be made. Life-history of Braconid parasite of *Trachys pacifica* Kerr.
14. Investigation of the control of measures for other pests.	Biology of Ferrisia Virgata. Ckll was studied and experiments for controlling it were made. The life-history of White-mite and nature of damage caused by it were studied. Preliminary experiments for controlling this pest were also made. Various insecticides were tried. Nicotine sulphate with soft soap solution was found effective against eggs and young larvae. Indigo as a trap-crop against 'Laphygma exigua was not found effective. Insect pests survey scheme was not approved.	

APPENDIX II

ANNUAL REPORT ON THE TECHNOLOGICAL RESEARCH SCHEME FOR 1946/47.

INTRODUCTION.

The work of the Agricultural Research Scheme in connection with the 1946 crop involved the growing of three strains of jute, together with a local strain for comparison, at a large number of subvention farms. The spinning and testing of the samples coming from this work, in order to get comparative figures for spinning quality, has formed one of the most important parts of the work of the Technological Research Laboratories in the year under review.

Another important project has been a fresh series of tests for the measurement of a number of physical fibre characters on samples of jute which had already been spun by the Technological Research Laboratories standard process to 10lb. yarns. The main object of this is to develop a prediction equation that will enable the spinning quality of a sample to be judged from the results of the physical measurements. The investigation has progressed very satisfactorily and it is hoped to complete it during the coming year. A general account of the progress made is given in the appropriate place in this report.

One of the most important matters attended to has been the relation between reed weight and spinning quality. Big, course plants tends to produce coarse, low quality fibre and *it therefore becomes most important in breeding work designed to increase yield per acre to endeavour to obtain the increase by means of a greater percentage of fibre in each plant,* rather than by producing big plants. In this connection an examination of the results of the spacing trials in relation to yield and quality has shown the importance of developing more reliable methods of establishing a crop with the desired spacing. There is a high mortality among the seed sown and the seed-rate alone cannot be relied on to give the desired spacing.

Some success has been met with in spinning 10lb. yarns from fibre samples as small as 2lb. in weight, using the full-scale machines.

Considerable progress has been made in the study of the role of lignin and hemicelluloses in the jute fibre, particularly in relation to bleaching and dyeing.

Various difficulties have further delayed the completion of the extension to the Laboratories but at the time of writing (March, 1947) the rooms are nearly finished and estimates for the bench-work, service-piping (gas, water and steam) and part of the electrical equipment have been accepted by the Local Sub-Committee.

Plants have been accepted to extend the batching-room in order to give better facilities for sampling and selection work and the question of installing standard artificial daylight lighting for this section is under consideration.

NOTE. In this report :—

Grist. is the weight, in pounds, of 14,400 yards.

Grex count. is the weight in grams of 10,000 metres. (or the weight in micrograms of one centimetre).

Wt. C. V. is a measure of irregularity, being (for 10lb. yarns) the co-efficient of variation of the weights of 2 in. lengths of yarn. The higher the Wt. C. V., the greater the irregularity.

Test length for yarn tests. The standard test-length is 24 in. and the tests are made at 80°F and 75% R. H.

1. SPINNING TECHNIQUE.

A series of tests was made in order to investigate the possibilities of using as little as 2 lb. of cut jute in small scale spins on standard machinery. Considerable success has been met with and the following will indicate the procedure adopted for spinning a 10 lb. yarn.

(*a*) Spread at breaker 2½ lb of batched jute on the special apron, distributing the fibre over 5 yds. length with a width of 10 inches, at the centre of the apron. Use standard draft. Discard first 15 yards of sliver delivered and collect next 48 yards.

(*b*) Cut the 48 yards into sixteen three-yard lengths and weigh each. Select, for carrying to finisher, the twelve lengths which show the most uniform weights.

(*c*) Superimpose the three yard legths in two lots of six and feed to two conductors of finisher. Use standard draft. Discard first 6 yards delivered and collect the next 35 yards. Cut the latter into 15 seven-foot lengths and weigh each. Select the 12 lengths which are most uniform in weight.

(*d*) Superimpose the twelve seven-foot lengths in threes to make four seven-foot lengths to carry to first drawing.

(*e*) Feed the four lengths so made up four-into-one at first drawing with draft 4·0. Discard 3 yards and collect 7½ yards.

(*f*) Feed to second drawing 2 into 1, with draft 4·23. Discard first one or two yards and collect about 16 yards.

(*g*) Cut into two (about 8 yard) lengths and feed 2 into 1 at roving. Draft 8·0.

(*h*) Spin with draft 8·0.

In this way well over 400 yards of yarn can be obtained, which is sufficient for the usual tests (strength, regularity, etc.). It is desirable to use "starters" of spare sliver of approximately the same weight per yard to lead the test-sliver into the roving-frame. A splash of dye-solution will show where the starter joins the test-sliver and the yarn coming from the former may be discarded. A similar procedure may be followed at the drawing frames, enabling a greater length of yarn to be obtained if desired.

The data in Table I, comparing the results obtained on similar pairs of samples using the standard Technological Research Laboratory method and the method described above, show that the latter in most cases gives fairly satisfactory results, but the spins from 2 lb. of fibre tend to have lower quality ratios and higher Wt. C. V.'s. In these experiments starters were not used and it is probable that better agreement would be obtained if this were done. The agreement is rather poor in the third experiment and the second last experiment. It may be noted that the last four experiments shown in the table were done in the early stages of the tests when the workers were still learning the details of the method. Some unusual occurrence was probably responsible for the discrepancy in the second last experiment, At least it may be said that there is good promise that a useful method using only 2 lb. of cut jute can be worked out.

TABLE I.

Quality Ratios and Wt. C. V.'s of fibre samples spun to 10 lb. yarn using T. R. L. standard method and new method from 2 lb. of cut jute.

Reference J	Standard		2-lb.	
	Q. R.	Wt. C. V.	Q. R.	Wt. C.V.
1401	85	22	82	26
1407	80	24	80	24
1398	70	25	59	27
1434	90	21	85	21
1459	99	22	99	22
1461	105	22	100	22
1464	111	20	104	21
1278	110	22	97	23
1362	67	26	57	31
1273	77	25	70	25
1326	112	23	112	21
1351	101	21	96	19
1458	103	20	100	22
1408	108	22	96	21
1409	99	22	91	24
1411	105	21	88	24
1419	94	25	88	24
Mean:	95	22	88	23

2. BACKGROUND RESEARCH.

A. The Chemistry of the Jute Fibre.

A number of investigations bearing on the role of lignin and hemicelluloses in the structure and behaviour of the fibre have been continued and some new studies have been carried out. A summary is given below.

1. The Absorption of Basic Dyes.

It has been commonly held that the natural affinity of the fibre for basic dyes is due to the presence of lignin. This view appears to be untenable, for it has been found that the completely delignified fibre has an even greater affinity than the raw fibre for basic dyes. Moreover, isolated lignin absorbs only a small quantity of basic dye under similar conditions and it is possible that even this small affinity is due to partial degradation of the lignin during isolation.

It has also been shown that raw jute treated with very dilute caustic soda solution (0·25 per cent) at room temperature absorbs under similar conditions (treatment was for one hour) almost twice as much methylene blue as the raw fibre. These observations may have considerable importance from a practical point of view; jute may be bleached (for example with sodium chlorite) to a very high colour and yet retain its affinity for basic dyes and furthermore a mild alkaline pretreatment, by increasing the affinity of the fibre for basic dyes, may enable deeper shades to be obtained than are obtainable on the raw fibre under similar conditions. Notes on the work have appeared in *Nature* (1946, *157*, 486) and *Science and Culture* (1946, *12*, 108).

2. *The Acid Nature of the Jute Fibre.*

A series of experiments have been made in which the 'acid value' of the jute fibre, both raw and after various pretreatments, has been estimated, using several methods, and compared with the quantity of methylene blue absorbed by the fibre under

standard conditions. The results show that a roughly quantitative relationship exists between the two figures. It appears that the acid nature of the fibre is almost entirely due to the presence of polyuronic acids, which probably do not occur free but are in combination with the pentosan constituents of the hemicellulose. It may be supposed that the pentosan units are united with the polyuronide units chainwise by means of other linkages. This view is based on the fact that mild alkaline treatments do not remove the polyuronides to any great extent, as they would if the polyuronides were free. On the other hand, hexosan constituents of the hemicelluloses are relatively easily removed in alkaline treatments. Removal of the polyuronic acids by alkaline treatments of the delignified fibre results in a great diminution in the affinity for methylene blue. A paper describing the work has been submitted for publication.

3. *Possible mode of association of lignin and polyuronic acids in jute.*

The large increase in acid value and methylene blue absorption produced by mild alkaline treatments (for example, 0·25% caustic soda at room temperature) suggests that the acid groups of the polyuronides are in part combined with lignin by means of ester linkages, and a number of observations support this view. Thus, the progressive removal of lignin by means of sodium chlorite results in a progressive increase in acid value. In the raw fibre a portion of the acid (carboxyl) group of the polyuronides appear to be free or in combination with the metals (calcium, etc.) that are found in the ash. It may be noted that the jute fibre, extracted by retting as usual, and cleaned from adherent tissue, has been found to contain little or no pectin.

The interpretations put forward regarding the association of the lignin and polyuronides may have interesting bearings on the nature of the lignin molecule and the mode of association of both these constituents with cellulose, but there seems to be little direct evidence at present to indicate whether the cellulose micelles are encrusted with the postulated lignin-polyuride-pentosan complex, or whether the pentosan-polyuronide combination

is more closely associated with the cellulose (*e.g.*, taking part in chain-molecules along with the cellulose). The latter arrangement would perhaps involve a chain-molecule structure for the lignin, which is not in accordance with the common view.

4. *The hemicelluloses.*

The hemicelluloses of jute are of considerable importance, forming well over 20 per cent. of the jute fibre, but published information regarding them is scanty. Recently they have been the subject of a special study to the Technological Research Laboratories. The results indicate that the fibre contains almost as much xylans as hexosans as constituents of the hemicelluloses. No close relationship has been found between xylan content and spinning quality. There are grounds for believing that the xylan units are not parts of the cellulose chain-molecules. In the delignified fibre there is no difficulty in removing the furfural-yielding constituents completely, or practically so. If the xylan units were incorporated in cellulose chains by ether linkages this would hardly be the case, particularly as it is known that the chlorite treatment used for delignification results in only slight degradation. The details of the work, with the results obtained and conclusions arrived at, have been written up in readiness for publication.

5. *The yellowing of bleached jute.*

It is well known that bleached jute has a tendency to become yellowish or brownish in colour after storage or exposure, especially when the bleaching treatment, as is usual, includes only mild alkaline treatments. Experiments bearing on this problem have been carried out and some interesting observations have been made. For example, jute bleached to a high degree of whiteness by means of sodium chlorite is found to preserve its colour remarkably well if kept immersed in ethyl alcohol, even when exposed to indirect sunlight, though it yellows if left exposed in air.

The more accessible hemicelluloses, for example, the hexosans which are easily removable by mild alkaline treatments, appear

to play an important part in the yellowing. When these are removed the yellowing is considerably reduced ; but it is by no means entirely avoided. If it were otherwise, practical bleaching problems would be greatly simplified. Since jute completely delignified by means of sodium chlorite still shows a marked tendency to become yellow in storage or exposure it seems certain that lignin is not wholly responsible for the yellowing.

If oxycellulose or residual lignin, or its decomposition products, are present in the bleached fibre yellowing is only to be expected, and lightly scoured and heavily chemicked jute is liable to contain both these bodies. The indications are however that the hemicelluloses, or their partially degraded products, are also important. Unfortunately treatments which remove the hemicelluloses are accompanied by a large loss in strength, particularly in the wet strength.

A preliminary note on the work done has been sent to *Current Science* for publication.

B. Physical.

An examination on a statistical basis, supported by examination of actual test results, have been made of the relative merits of the root-mean-square, mean deviation, mean range and probit methods of finding yarn irregularity (Weight C. V.) and a paper has been written up for publication.

3. TESTS ON J. A. R. L. SAMPLES.

A. 1949 Subvention Farms Trials.

The results so far available on the samples of selections C39-212, C41-13 and C42 Nj-412, together with the Locals, are summarised in Table II.

TABLE II.

1946 Subvention Farm Trials.

Quality Ratios of Standard 10 lb. yarns.

Centre	C39-212	C41-13	C42 Nj-412	Locals.
Gangasagar ...	109	108	101	105
Raipur ...	111	106	108	114
Baiderbazar ...	100	92	91	95
Lakhimpur ...	87	90	82	87
Nowgong (a) ...	82	69	77	77
Nowgong (b) ...	85	70	77	82
Munshiganj ...	84	99	85	87
Sarisabari ...	105	87	73	88
Pabna Sadar ...	64	59	52	70
Bera (Pabna) ...	104	102	100	102
Manikganj ...	98	74	92	96
Muktagacha ...	74	76	83	63
Noakhali ...	81	77	77	81
Shyamganj ...	107	100	104	98
Mean : ...	92	86	86	89

These results show that in the 1946 crop C39-212 has given better quality than the other selections and better than the Locals. As the yield is also better than that of the Locals the selection is a promising one. In twelve centres out of fourteen C39-212 ranked first or second as regards quality, and came first in eight centres and bracketed first with the Local at two others.

It remains to be seen if the superiority of C39-212 is maintained when all the samples have been spun, but the above results at widely distributed centres make it very probable.

The high quality ratios for these white jute samples obtained at Sarisabari and Shyamganj (Mymensingh), Gangasagar (Tipperah), Raipur (Noakhali), Baiderbazar (Dacca) and Bera (Pabna) may be noted.

B. Spacing, Stage of Harvesting and Retting Period Trials, 1945.

In the last Report the data for the 1944 trials were given. In 1945 the nominal spacings adopted were 6″ × 6″, 4″ × 4″ and 3″ × 3″. The results are given in Table III.

TABLE III.

Quality Ratio and : Wt. C. V. of 10 lb. yarns.

Stage of Harvesting.	Retting period.	Spacing.					
		3″ × 3″		4″ × 4″		6″ × 6″	
		Q.R.	Wt.C.V.	Q.R.	Wt.C.V.	Q.R.	Wt.C.V.
Bud	Below normal	107	22	107	19	106	20
	Normal	92	21	90	19	83	24
	Above normal	81	22	74	22	70	25
Flower	Below normal	107	19	102	24	99	21
	Normal	94	24	101	24	88	25
	Above normal	85	22	86	25	80	24
Pod	Below normal	108	22	105	21	193	23
	Normal	99	22	92	23	93	24
	Above normal	92	27	89	21	92	25

Controls : Below Normal 106 : 24
Normal 98 : 23
Above Normal 94 : 25

There is little difference in the quality obtained at the 3″×3″ and 4″×4″ spacings (average quality ratios 96 as compared with 94 and average Wt. C. V.'s the same, at 22%). But the 6″×6″ spacings fall behind, with average Q.R. 90 and average Wt. C. V. 23%. The yields were reported as 3″×3″, 1546 lb. per acre, 4″×4″, 1672 lb. per acre and 6″×6″, 1180 lb. per acre.

The bad effect of over-retting is once more very clearly seen. At least for these 10 lb. yarns, the period described as "below normal" has given the best results, and as in some previous years the flower stage has given inferior results to the pod stage. The overall mean results quality ratios for the bud, flower and pod stages for six years are given below.

	1940	1941	1942	1943	1944	1945
Bud ...	42	90	95	89	89	90
Flower...	50	73	89	80	84	94
Pod ...	47	104	79	86	88	97

An interpretation of the results is difficult. In different seasons the plants may react differently. One point for attention is that all the jute was cut at one time in collecting the material for each stage; individual plants at the desired stage were not selected, and it is possible that errors in judgement occurred as to the condition of the whole crop. It is also a possibility, worth further attention, that the flower stage stems ret more quickly than either the bud or pod stage stems. Finally, the results might come up differently if yarns finer than 10 lb. grist were spun.

In general it still appears that good fibre can be had if the jute is cut at the bud stage, providing other factors are favourable, and that the relative results at later stages depend on the season.

Regarding the effect of spacing particular attention is invited to the note which appeared in I. C. J. C. *Bulletin*, Vol. 9, No. 9, (December, 1946, p, 352). The actual average spacings

in the experiments under consideration must, from the average reed-weights, be considerably more open than the nominal spacings.

It is interesting to note that with an average reed-weight of 7·5 grams and an average spacing of 9″ × 9″ a yield of about 15·6 maunds per acre may be expected. With an average spacing of 5″ × 5″ a similar yield would mean an average reed-weight of only 2·32 grams. Practical conditions are no doubt much closer to the former case than to the latter,

C. Manurial Trials.

The 1945 crop experiment gave the results shown in Table IV. For details of the treatments reference may be made to the Report on the Agricultural Research Scheme.

TABLE IV.

Quality Ratios of 10 lb. yarns.

Treatment.	D. 154.	Chinsurah green.
N_1	91	102
N_2	88	112
N_3	95	110
K_1	89	103
K_2	94	100
K_3	88	99
N_1K_1	93	99
N_1K_2	93	106
N_1K_3	85	97
N_2K_1	90	103
N_2K_2	89	108
N_2K_3	88	105
N_3K_1	92	105
N_3K_2	93	104
N_3K_3	90	107
F. Y. M.	87	102

The main feature of the results is perhaps the rather small differences in quality resulting from the treatments given. Plain nitrogenous (N) manuring appears to give as good results as any.

There is an indication that heavy potash (K) manuring is detrimental to quality, especially if not supported by ample nitrogen—see results for K_2 and N_1K_2, both D154 and C. G.

D. Line versus Broadcast Sowing.

The 1946 trial results are shown in Table V.

TABLE V.

Quality Ratios of 10 lb. yarns.

Treatment		D154	Chinsurah Green
Lines 12″ apart No thinning	...	87	98
2″ × 12″	...	87	103
3″ × 12″	...	84	99
4″ × 12″	...	80	106
Broadcast	...	87	105

Here the D154 results are in line with previous ones and show consistently the lowering of quality with greater spacing. The results with Chinsurah Green show no general tendency and repetition seems desirable.

E. Effect of covering during retting.

No very striking differences are apparent among the following results, for tossa jute, though, if other factors were the same, it appears that bamboo leaf covering is significantly better than sugarcane leaf covering and that no covering at all is better than sugarcane leaf covering.

	Q. R. (10 lb. yarn.)
Sugar Cane Leaf	... $103 \pm 1{\cdot}2$
Shoti Leaf	... $109 \pm 1{\cdot}3$
Bamboo Leaf	... $111 \pm 1{\cdot}3$
No covering	... $109 \pm 1{\cdot}6$

4. TESTS ON COMMERCIAL FIBRE SAMPLES.

In view of the heavy work entailed in testing the numerous subvention farm samples and the continued difficulties of obtaining suitable samples it was decided, with the approval of the Local Sub-Committee, to undertake no systematic tests on the 1946 crop, but to make every effort to obtain a representative range of samples of the 1947 crop.

5. FIBRE CHARACTERS AND SPINNING QUALITY.

A. Physical Characters.

In the new series of tests referred to in the last Report, designed to examine the relation between the physical characters of the fibre and spinning quality, twenty five samples have been fully tested and further number partly tested. The work is therefore more than half completed. The results obtained are of very considerable interest and importance.

A new test has been developed which, from its simplicity and the close bearing of the results on spinning quality, promises to be very important. This is the "breaking twist" test. It is carried out by observing the number of turns which can be given to a standard bundle of fibres (of specified weight and length) before it breaks. The bundle is suitably mounted under a standard tension, with provisions from preventing the lower clamp from turning when the upper clamp is turned.

The list of tests undertaken, after slight modification of that given in the last Report, is now :—

1. Ballistic Work of Rupture of twisted fibre bundles
2. Fineness of fibre after standard hand-combing
3. Flexibility (spoke-wheel apparatus)
4. Torsional Rigidity
5. Apparent (or Bulk) Density
6. Breaking Twist
7. Diameter of Twisted Bundles
8. Average Reed-weight
9. Average reed-weight per metre

A summary of the results obtained is given below. It is hoped to publish the results in full detail when the series has been completed and prediction equations worked out.

(1) *Ballistic Work of Rupture of Twisted Fibre Bundles.* As found in earlier work, there is a rather close connection between this character (T. R. Memoir No. 5.) and the strength of standard 10 lb. yarns. One result out of 26 was rather erratic.

(2) *Fineness.* The relation to spinning quality is, as might be expected, not as close as in the case of the foregoing character, but the results are very significant as showing that in general quality is better in the finer fibre samples. Roughly, a grex count of 130 in the fibre fragments obtained after the standard hand-combing corresponds with a quality ratio of about 60 in 10lb. yarns, while a grex count of 70 corresponds with a quality ratio of about 110. The points are rather widely scattered about the curve relating the two characters but this is understandable on several grounds. Thus, over-retting may lead to the production of fine fibre but the strength of the fibre is liable to be low.

(3) *Flexibility.* An illustration of the instrument used is given in the Annual Report for 1939/40. The general tendency for fibre of better quality to be more flexible is very apparent; the degree of correlation, though significant, is not very high. For high quality fibre the number of spokes passing the tuft before the wheel comes to rest may be 40, or more, while for low quality, stiff fibre it may be only 20, or less.

(4) *Torsional Rigidity.* This is a very simple test in which the time of vibration of a horizontal disc, supported at its centre by a standard bundle of fibre, is noted. Rigidity is inversely proportional to the square of the time of oscillation. Quality improves significantly with decreasing torsional rigidity.

(5) *Apparent (or Bulk) Density.* This test was described in T. R. Memoir No. 8. The further results confirm that fibre of low bulk density tends to be of low quality. Such fibre feels light in the hand.

(6) *Breaking Twist.* The figures below will give an idea of the closeness of the connection between this character and spinning quality.

Quality Ratio (10 lb. yarn)	Breaking Twist* (t. p. i)	Quality Ratio (10 lb. yarn)	Breaking Twist (t. p. i)
122	4·27	93	4·12
111	4·32	90	4·21
110	4·27	89	4·04
108	4·38	88	4·12
107	4·18	85	4·22
104	4·09	82	3·99
103	4·20	77	4·05
100	4·31	74	3·82
99	4·07	71	3·82
99	4·32	65	3·76
97	4·26	62	3·58
97	4·07	55	3·69
96	4·15	52	3·67

*Mean of S and Z twist results.

It is interesting to note that as a rule the bundle withstands a little more twist when an S twist is given than when a Z twist is given.

7. *Diameter of Twisted Bundles.* This test is carried out by measuring (with an optical projection apparatus) the diameter of the same standard bundles that are used in the foregoing test, but long before the breaking twist is reached. In conformity with the related bulk density test it is found that fibre of lower

quality tends to produce a bundle with a higher diameter, indicating a less close packing of the strands.

8. *Average Reed-Weight.* A reed is the fibre coming from one jute plant. Average reed-weight is a very important character. Other things being equal the better qualities are found in jute that has a low average reed-weight. High average reed-weights indicate coarse, tall plants such as are liable to be produced when the crop-stand is very open. If the average reed-weight is 7·5 grams the quality ratio of a 10 lb. yarn (T. R. L. Standard) tends to be about 80, whereas an average reed-weight of 5 grams tends to go with a quality ratio of about 100. Naturally, since other factors are concerned, the points obtained by plotting reed-weight against quality-ratio are rather scattered, but the general tendency is very clear.

9. *Reed-weight per metre.*—Similar relationships to quality-ratio are noticed as in the case of average reed-weight. An average reed-weight of 3·5 grams per metre tends to go with a quality ratio of about 80, while an average reed-weight of 2·5 grams per metre tends to go with quality ratio of about 100.

It is only by combining the indications given by a number of characters, such as those reviewed above, that it can be hoped to predict spinning quality from physical fibre characters. The chief lacuna in the present programme is probably a test, or group of tests, which may be expected to yield adequate information regarding factors which influence yarn regularity, depending as it does largely on the behaviour of the fibre in drafting, that is when it is drawn through pins, or drawn part adjacent masses of fibre, and tests to fill the gap are under consideration.

Comparison of combed fibre and tow.—Since the procedure adopted in preparing the fibre for tests, by hand combing, results in the product of a fair amount of tow, which is neglected in the routine tests, it is important to know whether there are any considerable differences in quality between the combed fibre and the tow. Some experiments have been undertaken to examine this problem. The indications are that the rejection of the tow does not lead to serious loss of information. The tow obtained with a

fine set of pins is, however, considerably finer than the combed fibre. Differences have also been found in CO_2-yield (on boiling with strong hydrochloric acid), nitrogen content and apparent density, the differences tending to indicate lower quality in the tow. It would be more in accordance with what happens in spinning if the whole sample were combed down to tow and the strands straightened and parallelised before use for the physical tests. Difficulties arise in connection with the length of the strands in the tow, but the method is considered worthy of examination.

Splittability.—It has long been realised that spinning quality must largely depend on the way in which the fibre strands become progressively split down during carding and preparing. One sample of fibre may readily split down sufficiently to give a good 10 lb. yarn but may give poor results, owing to the difficulty of further splitting, if finer yarns are spun. Another sample, giving much the same performance in 10 lb. yarns, may be susceptible of further splitting and give good results in finer yarns. This is an important subject and further experiments are contemplated to gain necessary information.

Evidence regarding "splittability" might be obtained by comparing fineness after (a) light combing and (b) heavy combing. In this connection reference may be made to the "complexity index" described in T. R. Memoir No. 7.

Pressure of other work has prevented, during the past year, further trials to compare the results in spinning fibre to several counts.

6. GRADING.

The position reached was considered at the January, 1947, I. C. J. C. Meetings and a new Sub-Committee was appointed to go into the question of fixing new grades. At the July, 1946, Meetings of the I. C. J. C. the Director, Technological Research Laboratory, had suggested that, in view of the difficulties met with getting the trade to adopt the schemes so far put forward,

the best procedure might be to go slowly, step by step, introducing only small changes at a time. One important matter was the reintroduction of the restrictive phrase into the description of Bottoms, preventing inclusion in it of fibre "acceptable under, or capable of inclusion in, a mark above." On this basis, and aiming for the present only at splitting up the present unsatisfactory class of Bottoms the following scheme has been proposed.

White Jute.

Mark	Colour	Cuttings percentage	Remarks.
Tops	Good	Up to 25	No change from current description.
Middles	(a) Good (b) Medium	26 to 35 Up to 35	Ditto
Low Middles	Good	36 to 50	New Mark
Bottoms	Inferior to any of above, but not to contain more than 70% cuttings.		We have merely removed new "low middles" from Bottoms. And see Note *iv* below.

NOTES.—(*i*) Jute capable of inclusion in any mark must not be put under a lower mark.

(*ii*) The scheme is confined to sound, straight-morahed jute.

(*iii*) Colour refers to "colour of district", as at present.

(*iv*) Reference to "Sacking weft content" is omitted and only cuttings percentage is considered.

(*v*) For tossa jute (and *olitorius* fibre in general) reduce all percentages by 10.

An alternative scheme, going a little further in the subdivision of present "Bottoms" is as follows (the notes as above apply here also).

White Jute.

Mark	Colour	Cuttings percentage
Tops	Good	Up to 25
Middles	(a) Good (b) Medium	26 to 35 Up to 30
Low Middles	(a) Good (b) Medium (c) Dark	36 to 50 31 to 40 Up to 25
Bottoms	Inferior to above, but not to contain more than 70% of cuttings.	

The first scheme* comprises only five types (or subgrades) and should present no difficulties in practice. Even the second scheme, with two more sub-grades, involves no more complicated selection than what is, in practice, done at present in many baling centres; it has the advantage of dealing specifically with dark jute with up to 25% of cuttings and medium-coloured jute with 31 to 40% of cuttings, both of which are rather important types.

7. MOISTURE RELATIONSHIPS.

Continuing the work described in previous years in connection with the moisture regain of jute held ready for sale

*At a meeting of the new Grading Sub-Committee held on 2nd April, 1947, it was agreed to change "good" to "any" in the description of the colour of Low Middles (first scheme).

up-country during the moist months of August to September, or early October, some further samples have been obtained (1946 crop) and tested. The results are given below :—

Source	Place of collection.	Date of collection.	Regain per cent.
Jamalpur ... (Mymensingh)	Palkalia	25-8-46	15·5
,, ...	Ramnagar	25-8-46	20·0
Shyamganj ... (Mymensingh)	Kanolpur	28-8-46	25·3
,,	,,	15-9-46	24·2
Jamalpur ... (Mymensingh)	Gopalpur	18-9-46	23·9
,, ...	,,	18-9-46	24·8
Faridpur ...	Domsa	?	20·8
,, ...	,,	?	14·3
,, ...	Sindiaghat	?	16·1
,, ...	,,	?	14·5
Bogra ...	Malalipur	15-9-46	20·4
Pabna ...	Sanirdiar	19-9-46	48·4
Jessore ...	Manirampur	7-9-46	15·1
,, ...	Jhikargacha	8-9-46	33·0
Domar ...	Chikanmati	18-9-46	24·2
,,	,,	18-9-46	19·7

Two samples have certainly inexcusably high moisture regains. A review of the others seems to suggest, as before, that a regain exceeding 20% can normally be avoided if proper care is taken.

8. STORAGE OF SUGAR.

Previous work had indicated that considerable slowing down of the deterioration of sugar stored in jute bags in a damp atmosphere could be obtained by antiseptic treatment of the cloth and it was decided to make an experiment on a fairly large scale, using a powerful antiseptic, the object being to make a crucial test, in spite of the fact that the chemical employed could not be used in practice. Accordingly, two bags each holding about 103 lb. of sugar were used, the cloth of one bag having been treated by immersion in a one per cent. solution of mercuric chloride. The cloth for the other bag, to be used as a control, was similarly treated in water only.

The bags containing the sugar were stored during July-September, 1946, in an ordinary (unconditioned) room through which the external air could circulate. There was a striking difference in the behaviour of the two bags. The bag without antiseptic showed damp patches in a few days and attracted flies and other insects, and syrup began to collect in the tray below the bag in about 38 days. During this period the bag with antiseptic remained dry ; syrup began to collect after 66 days. After 38 days the bag without antiseptic had increased in weight by 3·9 lb., due to absorption of moisture, where as the other bag had increased in weight by only 1·7 lb.

A full account of the work, along with the previous experiments, has been submitted for publication. The general conclusion still remains that while antiseptic treatment may delay deterioration it cannot be expected to prevent it indefinitely when the storage takes place in a damp atmosphere. Once syrup formation has started it tends to progress at an increasing rate. Hence the importance of seeing that the sugar is in good condition when bagged.

9. BLENDING EXPERIMENTS.

No work was possible on the main problem of blends of jute of different types but a few trials were made on the blending of jute with Celafibre (cellulose acetate staple fibre of 18 denier and 8 inch length). Using a method similar to that described under Section 1 (Spinning Technique) it had been found that the

Celafibre spun very satisfactorily on the standard jute machinery of the Laboratories, the fibre being spread at the finisher card. So little difficulty was experienced that it was possible to make a satisfactory yarn from as little as 11 oz. of fibre spread at the finisher. In the blending trials the Celafibre was spread over a sliver of jute fibre on a special narrow apron which could be attached to the ordinary apron of the finisher.

Examination of the slivers, rove and yarns showed that the two fibres blended intimately. No difficulty at all was encountered in spinning to a 4 lb. yarn.

10. SINGLES AND DOUBLING TWISTS.

Technological Circular No. 2 has been published, dealing with the relation between yarn twist and breaking load and in Technological Pamphlet No. 3 an account has been given of the effect of singles and doubling twist on the strength of 3-ply yarns. No further experimental work has been done during the year but some theoretical papers bearing on the problems have been written up by Mr. B. K. Chakrabarti.

11. JUTE COMPETITORS, ETC.

Spinning and fibre tests were made on two varieties of *Hibiscus cannabinus* fibre (Bimli jute, mesta pat, ambari), one sample of *Hibiscus Sabdariffa,* var *Altissima* (I. P. Sab, 5) and two hybrids of the latter with another *Sabda iffa* strain, These were received from the Division of Botany, Agricultural Research Institute, New Delhi, through the Superintendent, Botanical Sub-Station, Pusa. The samples were spun to both 10 lb. and 20. lb. grist.

The *Hibiscus cannabinus* samples gave quality ratios of 81 to 82 and 87 to 92 at 10 lb. and 20 lb, grist respectively while the *sabdariffa* hybrids were distinctly inferior, with quality ratios of 43 to 68 and 47 to 75 at the two grists. The *altissima* sample gave 70 and 85 quality ratios.

It will be seen that these *Hibiscus cannabinus* samples approach an average white jute as regards the quality ratios of

10 lb. yarn, though it is to be remembered that quality ratios of 90 or above are not uncommon in white jute. The relative coarseness of these fibres is no doubt one of the important causes of their inferiority to jute.

A sample of *olitorius* Argentine jute was also examined. It was of low quality and had obviously been very poorly handled during fibre extraction. The presence of ripe capsules indicated that it had been saved at a late stage of maturity. Spun to 10·2 lb. grist it gave a quality ratio of only 43 and the Wt. C. V. (2 in. length) was 30%. In the condition in which it was received it was little better than habbi-jabbi. Much better samples of Argentine jute have been seen.

12. SPECIAL TREATMENTS OF YARN AND FIBRE.

Some experiments have been made to examine further the effect of mild treatments with alkalies, acids and salts, alone and in combination, on the strength (both wet and dry) of yarn and fibre. The effect of similar treatments on the flexibility of fibre have also been examined. The interpretation of some of the results is difficult and further work is required. Some further work with sodium chlorite and Textone has also been done. Examples of the results obtained are given below.

A 10 lb. yarn was separately treated in three portions (a) with distilled water (b) with a one per cent. solution of caustic soda at room temperature for one hour, followed by a sour in decinormal hydrochloric acid and washing until neutral, (c) soured in hydrochloric acid and washed. The cut-skein method was used and the quality-ratios obtained in dry single thread tests were as follows :—

Treatment	*Q. R.*
(a) Water only	85
(b) Caustic soda, sour, wash	88
(c) Sour, wash	83

The small and scarcely significant rise in strength in treatment (b) may be due to the increase in interstrand friction caused by partial removal of fatty substances. This effect may

over-balance a greater, but still small, loss in the strength of the strands themselves. Solvent-extracted yarn did not show an increase in dry strength when steeped in dilute caustic soda at room temperature and compared with yarn steeped in water only. In fact in two experiments, with and without a subsequent sour, there was a very significant loss in strength.

Wet tests on yarns similarly treated give quite different results.

Treatment	*Q. R.*
(a) Water only	73
(b) Caustic soda, sour, wash ...	38

It was found that steeping in sodium chloride solution after treatment (b) raised the wet quality ratio to 45. (In calculating quality-ratio the dry grists are of course used).

We see that even such a mild treatment as steeping for one hour at room temperature in a one per cent solution of caustic soda produces a big loss in wet strength. This is thought to be due to the removal of some of the hexosan constituents of the hemicelluloses possibly aided by the partial modification of the remaining hemicelluloses. It is likely that the hemicelluloses concerned are located largely in the natural 'cement' between the ultimate fibres.

In two experiments the flexibility (spoke-wheel tester) of jute fibre was found to be significantly increased by steeping in dilute caustic soda (0·5 per cent and 1·0 per cent) for one hour at room temperature, followed by a sour and wash, as compared with treatment with water only, or by a sour and wash only.

13. UTILISATION OF WASTE.

Arrangements were made for 20 maunds of shakered fibre to be sent for making into boards to be used in refrigeration insulation trials. The work has been delayed by the failure of the consignment to reach the destination and a further supply has been ordered.

14. NEW OR EXTENDED USES.

It should be pointed out once more that with present facilities and staff little work can be done under this head without

encroaching on the work for which the Laboratories were planned, namely that directed towards the improvement of the raw material.

Following up the work on the use of jute ply-yarn for knitting some samples of softened jute 3-ply yarn were dyed with direct dyes of good fastness in suitable dark shades and sent for knitting into garments for use in the work of the Calcutta Hindu Rehabilitation Centre. A report on the results is awaited.

Mr. A. S. Gillies, Manager, T. R. L., during his tour of the U. K. on deputation during September 1946 visited manufacturers of knitting machines with a view to ascertaining, *inter alia*, the types and sizes of jure yarn or ply-yarn that could be suitably knitted on the available machinery. It is reported that 5 lb. singles could be used on a machine with six needles to the inch. This would mean about 2½ lb. singles in a 2-ply yarn or 1·7 lb. singles in a 3-ply yarn. To make use of ply-yarns that are at present readily available a coarser machine is required.

Experiments are in progress to see the softening effect on ply-yarns of steeping in caustic soda solutions of various strengths, including strengths which have a pronounced shrinking effect. There may be some rather critical concentration at which considerable softening and increase in bulk density (and hence of warmth) can be obtained without an unduly great reduction of wet strength.

16. INFORMATION.

A fair number of new text-books have been added to the Library during the year. A very good collection of books on analytical statistics, which are very important for the work of the Laboratories, is now available.

Mr. S. N. Chakrabarti resigned during the year to take up a new appointment and Mr. A. Krishnan was appointed in his place as Librarian.

GENERAL.

Equipment.

A *p*H meter has been added to the equipment of the Laboratories. An instrument for testing the hardness of jute fibre strands and an instrument for measuring yarn irregularity have been under construction in the Laboratory workshops and both are expected to be ready for use shortly.

Visitors.

Among visitors to the Laboratories during the year the following may be mentioned.

Sir Datar Singh	...	Vice-Chairman, I.C.A.R., President. I.C.J.C.
N. M. Khan, Esq.	...	Director of Agriculture, Bengal.
M. S. Rhandava, Esq.	...	Secretary, I.C.A.R.
Dr. Whittaker	...	Director, Fuel Research Institute.
R. C. Parsons, Esq.	...	Chief Inspector of Factories, Bengal.
Rai Bahadur S. Chatterjee	...	Calcutta Hindu Rehabilitation Centre.

Various representatives of Imperial Chemical Industries (India) Ltd., and a fair number of representatives of jute mills in the Calcutta area and elsewhere also visited the Laboratories.

On March 14th 1947, the Director, Technological Research Laboratories, gave a lecture in the Bengal Chamber of Commerce on the "Physical and Chemical Characters of Jute in Relation to Processing and Utilisation". This was well attended by representatives of the Calcutta mills.

A start has been made in the preparation of exhibits for the I. C. J. C. Museum at headquarters.

Thanks are due to the staff for their efforts to attend as regularly as possible when the local conditions made this very difficult during several periods.

A list of the staff of the Laboratories and a tabular summary of this report are appended, together with a list of publications to date.

C. R. NODDER.

STAFF OF TECHNOLOGICAL RESEARCH LABORATORIES.

Director	... Mr. C. R. Nodder, O.B.E., M.A. (Cantab).
Manager	... Mr. A. S. Gillies, A.T.I., F.R.S.A.
Senior Research Physicist	... Dr. K. R. Sen, D.Sc., (Dacca).
Senior Research Chemist	... Dr. P. B. Sarkar, D.Sc., (Dacca).
Junior Research Assistant (Physicist)	... Mr. B. K. Chakrabarti, M.Sc.
Junior Research Assistant (Chemist)	... Mr. H. Chatterjee, M.Sc., A.I C.
Head Tester	... Mr. S. B. Bandopodhyay, M.Sc.
Senior Tester	... Mr. S. R. Guha, B.Sc.
,,	... Mr. P. R. Mukherjee, B.Sc. (Hons).
,,	... Mr. A. K. Mazumdar, B.Sc., (Hons).
Junior Tester	... Mr. S. K. Mukhopadhyay, B.Sc.
,,	... Mr. S. K. Bose, B.Sc.
,,	... Mr. U. Chatterjee, B.Sc.
,,	... Mr. K. B. Pal, B.Sc.
,,	... Mr. S. R. Das, B.Sc.
,,	... Mr. M. Dutt, M.Sc. (Calcutta).
,,	... Mr. H. Ghosh, B.Sc.
,,	... Mr. S. K. Guha, B.Sc.
Statistical Clerk	... Mr. N. K. Ghosh, B.Sc.
Electrician	... Mr. R. K. Bhattacharjee.
Librarian	... Mr. A. Krishnan, B.Sc.
Head Clerk & Stenographer	... Mr. T. C. Chakraburtty.

Papers published since the work commenced in Technological Research Laboratory include the following :—

Technological Research Memoirs.

No. 1. A Technique for Spinning Yarn Samples from small Quantities of Fibre. By C. R. Nodder and A. S. Gillies.

No. 2. The Relation between Physical Fibre Characters and the Spinning Quality of Jute. By C. R. Nodder, K. R. Sen and B. K. Chakrabarti.

No. 3. The Moisture Regain of Jute at a Range of Atmospheric Humidities. By C. R. Nodder, K. R. Sen and B. K. Chakrabarti.

No. 4. Tests on Commercial Jute Yarns. By C. R. Nodder.

No. 5. The Ballistic Work of Rupture of Twisted Bundles of Jute Fibre and its Relation to Spinning quality. By B. K. Chakrabarti, K. R. Sen and C. R. Nodder.

No. 6. The Relations between the Chemical Fibre Characters and the Spinning Quality of Jute. By P. B. Sarkar, S. B. Bandopadhyay and C. R. Nodder.

No. 7. The Measurement of Important Physical Characters of Jute Fibre Strands and their Relation to Yarn Quality. By K. R. Sen and C. R. Nodder.

No. 8. The Apparent Density of Jute Fibre and its Relation to Spinning Quality. By B. K. Chakrabarti, C. R. Nodder and K. R. Sen.

No. 9. The Single Thread Strength of Jute Yarns in Relation to Test Length. By K. R. Sen and C. R. Nodder.

No. 10. The Effect of Moisture on the Strength of Jute Yarns. By K. R Sen, S. B. Bandopadhyay and C. R Nodder.

No. 11. The Improvement of Jute Bags for the Storage of Sugar. By P. B. Sarkar and H. Chatterjee. (In the press).

Technological Research Pamphlets.

No. 1. The Spinning of Flax on Jute Machinery. By A. S. Gillies.

No. 2. The Assessment of Quality. By C. R. Nodder.

No. 3. Some Notes on the Strength of Jute Ply Yarns. By C. R. Nodder.

Technological Research Circulars.

No. 1. Circular on Jute Yarn Testing. Part I. By B. K. Chakrabarti, C. R. Nodder and K. R. Sen. Part II. By C. R. Nodder, K. R. Sen and B. K. Chakrabarty. (In the press).

No. 2. The Relationship between Twist Factor and Strength in Jute Yarns. By B. K. Chakrabarti, A. S. Gillies, C. R. Nodder and K. R. Sen.

Miscellaneous.

No. 1. The Opening of the Research Laboratories.

No. 2. Technological Research 1939-44. Research Results Recommended for Practical Application. By C. R. Nodder.

No. 3. The Colour of Shamla Jute : Its Cause and Removal. By C. R. Nodder, P. B. Sarkar and H. Chatterjee. (*Science and Culture*, Vol. III, 1942-43, pp. 45-46).

No. 4. Jute and Flax. By C. R. Nodder. (Indian Farming. Vol. 1, No. 3, March, 1940).

No. 5. Prospects of Chemical Retting for Jute. By C. R. Nodder, (*Indian Farming*, Vol. II, No. 2, February, 1941).

No. 6. Hints to the Jute Growers. By A. S. Gillies. (*Indian Farming*, Vol. III, No. 1, January, 1042).

No. 7. Retting Jute with Chemicals. By H. Chatterjee, C. R. Nodder and P. B. Sarkar. (*Science and Culture*, Vol. IX, pp. 451-453, 1943-44)

No. 8. The Utilisation of Jute Waste. By C. R. Nodder. (*Journal of Scientific & Industrial Research*) Vol. 4, No. 3. September 1945, pp. 128-29.

No. 9. Sodium Chlorite as a Reagent for the Estimation of Cellulose. By P. B. Sarkar and H. Chatterjee. (*Science and Culture*), Vol. X, pp. 340-42, 1944-45.

No. 10. A New Method for the Estimation of Cellulose. By H. Chattopadhyay and P. B. Sarkar. (Proc. Nat. Inst. of Sciences of India, Vol. XII, No. 1, pp. 23-46, 1946.)

No. 11. Jute Substitutes. Appendix by C. R. Nodder to Economic Research Bulletin No. 2, By K. C. Basak.

No. 12. Portions of Articles on *Jute*, submitted as a contribution to the proposed new Dictionary of Economic Products and Industrial Resources of India.

No. 13. The absorption of Basic Dyes by Jute. By P. B. Sarkar, H. Chatterjee and A. K. Mazumdar (*Nature*, 1946, Vol. 157, p. 486).

No. 14. The Relation between the Acid Values of Jute Fibre and its Absorption of Methylene Blue. By P. B. Sarkar H. Chatterjee and A. K. Mazumdar. (*Science and Culture*, Vol. XII, 1946, p. 108).

No. 15. The Yellowing of Bleached Jute. By P. B. Sarkar (*Current Science*, 1947, Vol. 16, No. 3, p. 74).

No. 16. Review of Discussions on Jute Grading (in the press).

The following papers have also been completed :—

The Acid Nature of the Jute Fibre. Sarkar, Chatterjee and Mazumdar. (Submitted for publication)

The Acid Nature of Vegetable Fibres in Relation to their basic dye absorption. Sarkar, Chatterjee, Mazumdar and Pal. (Submitted for publication)

The Hemicelluloses of Jute Fibre. P. B. Sarkar and others (Ready for publication).

In addition, a number of papers dealing with various aspects of yarn testing and some theoretical aspects of twist factor in relation to yarn characters are in preparation.

No. 17. The orientation and size of Micelles in Jute Fibre. By S. C. Sarkar, D.Sc., F.N.I. and N. N. Saha, M.Sc., University College of Science, Calcutta—Published in the Proceedings of the National Institute of Science of India. Vol. XII, No. 3, pp. 151 to 157 (1946).

No. 18. On the X-Ray diffraction patterns of bleached jute fibre. By S. C. Sirkar and S. K. Chowdhury—Published in the Indian Journal of Physics Vol. XX, Part I, February, 1946.



APPENDIX

Item	Progress	Future work
1. Spinning Technique.	Considerable success was obtained in spinning samples as small as 2 lb. (cut jute) on the ordinary full size machines.	It is desirable to continue the tests using "Starters" at some of the machines, as described in the report.
2. Background Research.	(*a*) Absorption of basic dyes by jute. Evidence has been obtained that it is the hemicelluloses, rather than the lignin, that are responsible for the great affinity for basic dyes which is shown by the jute fibre. (*b*) The acid nature of the jute fibre. Work which has been done suggests that the polyuronic acids of the hemicelluloses (which form over 20% of the raw material) are the cause of the acid nature of the jute fibre. Mild alkaline treatments tend to remove the hexosan constituents of the hemicelluloses rather than the polyuronides. (*c*) Lignin and polyuronic acids. The large increase in methylene blue absorption produced by mild alkaline treatments and the	The work on the role of lignin hemicelluloses, etc. in the structure and behaviour of the fibre should continue.

Item	Progress	Future work
2.—Contd.	progressive increase in acid value the as lignin is removed suggest an ester linkage between the lignin and the polyuornides of the hemicelluloses. (*d*) The hemicelluloses. It is suggested, on the basis of experiments which have been carried out, that the polyuronides of the hemicelluloses form chain-molecules, with ether linkages, with the pentosans. There are grounds for believing that the xylan units do not take part in the cellulose chain molecules ; there is no difficulty in removing furfural-yielding constituents completely from the delignified fibre. (*e*) The yellowing of bleached jute. Observations made indicate that the hemicelluloses, particularly the hexosans, may contribute to the yellowing of partly bleached jute on exposure or storage, Lignin, oxycellulose and other constituents may also contribute. Jute, bleached by sodium chlorite, does not yellow if stored under alcohol.	

3. Tests on J. A. R. L. Samples.	(*a*) The tests so far made of the 1946 crop subvention farm trials of the selections C39-212, C41-13 and C42 Nj-412 indicate that C39-212 has generally yielded fibre of better quality than the other selections or the Locals used for comparison.	(*a*) The work must continue as required, but the number of samples sent for quality tests should be reduced to the lowest satisfactory minimum to avoid interference with other T. R. L. investigations.
	(*b*) Spacing, etc. trials. The results of the 1945 trials are given. The closer spacings have again given the best quality and, once again, the harmful effects of over-retting are clearly seen. A summary of the six years (1940-45) results on the effect of stage of harvesting is given. Attention is called to discrepancies between nominal and actual crop stand. From average-reed weight and crop stand it appears possible to estimate yield per acre rather accurately.	(*b*) Further experiments with very careful control of the actual spacing of mature plants are desirable.
	(*c*) Manurial Trials. 1945 Crop experiments show rather small differences in quality with variations in manuring. Plain nitrogenous manuring appears to be favourable to good quality. Heavy potash manuring may be detrimental, especially if not supported by ample nitrogen.	(*c*) Further samples may be tested as required.
	(*d*) Line *versus* broadcast sowing. With D154 the 1945 crop samples showed better quality	(*d*) Ditto.

Item.	Progress.	Future work.
3.—*Contd.*	with closer spacing. With Chinsurah Green there was no very clear difference in quality at different spacings in this season.	
	(*e*) Effect of covering during retting. A sugar-cane leaf covering gave fibre of lower quality than a bamboo-leaf covering, but with no covering at all the quality was almost as high as in any of the covered samples.	(*e*) Further samples may be tested as required. Repetition seems desirable.
4. Tests on Commercial Fibre Samples.	In view of the heavy work under other heads it was agreed that further trials should be deferred until 1947-48.	The work should continue annually on a sufficiently large number of representative samples. Trade co-operation is important.
5. Fibre Characters in Relation to Spinning Quality.	The progress made in carrying out the following tests on samples of known spinning quality is described (a) Ballistic work of rupture of twisted fibre bundles, (b) Fineness, (c) Flexibility, (d) Torsional Rigidity, (e) Bulk Density, (f) Breaking Twist, (g) Diameter of Twisted Bundles, (h) Average reed-weight, (i) Average reed-weight per metre. It is hoped that good prediction of quality will prove possible on the basis of some four of five of these tests, *e.g.*, (a), (b), (d), (f) and (i), or some other combination.	It is hoped to complete the present series of tests during 1947-48. Further work should pay attention to factors influencing the behaviour of the fibre in drafting. Work is necessary on the prediction of spinning quality at various grists. In this connection further study of splittability is important.

6. Grading.	The position reached was reviewed at the I. C. J. C. meetings held in January, 1947 and a new Sub-Committee was appointed to consider further stems. It appears essential to proceed step by step in trying to introduce improved methods. Schemes are suggested which depend on the division of the present unsatisfactory "Bottoms".	The reactions of the trade association to a scheme arrived at on 2nd April 1942 are awaited.
7. Moisture Relationships.	Further moisture regain results on samples collected up-country in August and September 1946 are reported. As before it appears that it may be difficult during these moist months to ensure a regain of less than, say, 20% in jute offered for sale up-country.	Further work may be done. Close local supervision is necessary to ensure that proper weights are packed and suitable representative samples obtained.
8. Storage of Sugar.	The results of several years work have been written up and submitted for publication. A new crucial experiment, using 1 cwt. samples of sugar in treated and untreated bags, confirmed the action of antiseptic treatment of the bags in delaying deterioration during storage in a moist atmosphere. Complete protection during storage in ordinary bags appears to be impossible, even if antiseptics are applied. It is important that the sugar should be as pure and as dry as possible when bagged.	Safe (non-poisonous) antiseptics require further study in order that a suitable treatment may be worked out.

Item	Progress	Future work
9. Blending Experiments.	Little work under this head could be fitted in, but some experiments on jute-Celafibre blends were carried out. No difficulty was found in spinning the mixture on ordinary machinery.	Further work on the general problem of blending should be taken up as soon as it can be fitted in. This depends largely on the number of JARL samples received.
10. Singles and doubling Twists.	No experimental work during the year. Some further theoretical studies have been made and written up. Technological Research Circular No. 2 and Technological Research Pamphlet No. 3 which deal with experiments under this head were published during the year.	Much remains to be done on the lines indicated in last year's report, but it is doubtful if any considerable experimental work can be fitted in during the coming year.
11. Jute Competitors.	Some samples of mesta pat, roselle and Argentine jute were spun and tested.	Data should be accumulated as opportunity permits.
12. Special Treatments of Yarn and Fibre.	The action of mild treatments with alkalies, acids and salts on jute fibre and yarn has been examined in order to see the effect on strength and softness. Even such a mild treatment as steeping for one hour at room temperature in a one per cent solution of caustic soda produces a very large loss in wet strength (quality ratio reduced from 73 to 38). Similar treatments produce a noteworthy increase in flexibility. Both	The work may continue.

12.—*Contd.*	effects appear to be due mainly to the removal of the hexosan constituents of the hemicelluloses. Further work has been done in our study of the action of sodium chlorite on jute fibre and yarn.	
13. Utilisation of wastes.	The use of boards, for refrigeration insulation, made from shakered fibre has been followed up, but the work was delayed by the loss of a consignment of fibre sent to a paper mill for treatment.	The work may continue.
14. New Uses.	Samples of softened jute ply-yarn, dyed in Technological Research Laboratories with reasonably fast direct dyes, have been sent to an enquirer for knitting into garments for use in the work of a rehabilitation centre. A report is awaited.	Work on similar lines may continue. The study of the possibilities of jute-wool union clothes for clothing is proposed.
15. *Ad hoc* Investigations.	Further enquires have been made regarding machines suitable for knitting jute yarns. Several samples of fibre and yarn sent by various firms were examined and reported on.	Only a limited amount of work can be done under this head with the present facilities and staff.
16. Collection of Information.	Work has proceeded on the usual lines. A fair number of new text-books have been added to the library.	May continue.

APPENDIX III

ANNUAL REPORT OF THE MARKETING SECTION FOR THE YEAR 1946-47

During the year under review Mr. S. M. Gupta, Marketing Officer, was in charge of the Section.

The Section experienced difficulties in executing the programme of work according to plan on account of lack of staff both at the headquarters and in the mofussil as well as on account of disturbances in Calcutta.

2. A resume of the work done during the period is given below :

I. *Experimental Co-operative Jute Sale Societies in Bengal*

The two Societies at Sarisabari (Mymensingh) and Belakoba (Jalpaiguri) continued to operate according to schedule ; but unfortunately, the business of the Sarisabari Co-operative Jute Sale Society was suddenly brought to a close in the second week of August 1946 as a result of some defalcation of the Society's funds being detected. The other Society however continued to work as before till the end of February, 1947.

3. The Scheme for the expansion of the Sarisabari Co-operative Multipurpose (Jute Sale) Society which was given effect to in the latter part of the previous year provided, among others, for the issue of short-term loans to its members in order to help them in production and marketing of the fibre. Accordingly, the sum of Rs. 1075/- was advanced to 75 selected members in May, 1946. There were 667 member-residents within the six unions which comprised the area of operation under that scheme. But of these only 385 members applied for loan. On a careful scrutiny of these applications, it was found that only 75 members fulfilled the conditions for receipt of loans, namely, *supply* of jute to the Society in any previous year. It may further be noted that these 75 members belonged to 3 unions only. Rs. 10/- to 25/- were paid as loan to each of them depending on the amount of

individual paid up share capital. The rate of interest charged was 7½ per cent as against 9 per cent per annum charged by the rural Co-operative Societies of that locality. Another condition of the loan was that it was to be repaid with interest within a year. The loan thus advanced was well secured in the sense that each borrower had to pledge his produce to the Society besides furnishing personal sureties with sufficient assets as collateral security to cover the loan given to him. It is gratifying to note that the loan together with the interest thereon was realised from the borrowers in full.

4. The Marketing Officer on being suspicious about the working of the Society towards the end of June 1946, directed the Committee's Superintendent of Jute Sale Societies to undertake a thorough investigation into the transactions of the Society. The 1945-46 jute season came to an end and it was considered necessary to have the statutory audit completed along with the investigation. Accordingly, the local Co-operative Auditor and the Committee's Superintendent started a joint investigation as a result of which defalcation to the extent of Rs. 1766/- was detected. This matter was placed before the Local Sub-Committee at its meeting held in September, 1946 for consideration when it decided among others :

(1) that the Committee's Co-operative Multipurpose (Jute Sale) Society at Sarisabari should immediately cease to function,

(2) that searching enquiries must be made into all the previous accounts of the Society to see what had been happening in the past years, and

(3) that persons concerned in the defalcation should be prosecuted.

Accordingly, the first information was lodged with the Jamalpur police and the staff were disbanded on the 15th October 1946. The financial assistance of the Committee towards the Society was also withdrawn from that date.

5. The police took cognisance of the allegations made against the superior staff of the Society, but by the time they

took any action in the matter all of them left Sarisabari. Warrant of arrest was therefore issued against them by the Police. Departmental investigation was carried on with regard to previous year's accounts and it was found that a further sum of Rs. 1819/- was misappropriated bringing the total amount involved to Rs. 3587/- (Rupees three thousand five hundred and eighty seven). The police took up the investigations but they carried on very slowly in spite of our best efforts to expedite it with the result that investigation part of the case is still incomplete. However, 3 out of 4 miscreants appeared meanwhile before the Court and were enlarged on bail. A comprehensive report on the matter was placed before the I. C. J. C. at its last January meeting.

6. The services of the Superintendent of the Jute Sale Societies, Indian Central Jute Committee had to be retained till the end of March, 1947 in order to enable him to complete the departmental investigation and audit and to assist the police in their investigations. It is learnt that the local Co-operative Auditor has since been advised by the Co-operative Department to help the police. It is gratifying to note that the Manager of the Society made good Rs. 1700/- out of Rs. 1766/- detected at the earlier stage of the investigation.

7. The Government of Bengal advanced to the Society the sum of Rs. 10,000 (Rupees ten thousand) as the annual working capital at an interest of 5% per annum. Of this, the sum of Rs. 9681-1-6 (Rupees nine thousand six hundred eighty-one, one anna and six pies) together with the interest of Rs. 128-14-6 was paid back into the Jamalpur Treasury by the middle of October and the balance was paid in the first part of January, 1947.

8. The share capital of the Sarisabari Co-operative Multipurpose (Jute Sale) Society increased from Rs. 1184/- to 1253/- during the period under review. It commenced its business operations for the season 1946-47 on the 10th July, 1946 and purchased about one hundred maunds of jute upto the middle of August when the transactions were closed on account of the defalcation. This was disposed of at a later date.

9. The statutory audit of the Society for the season 1945-46 is understood to have been completed; but the audit note and the

statement of accounts as prepared by the Co-operative Department have not reached this office as yet. Therefore, no idea can be given about the exact financial position of the Society. But from a rough examination of the accounts available in this office it appears that the Society has incurred some loss. It may however be asserted that had there been no misappropriation of Society's funds, the Society would have earned some profits (gross).

10. As regards the Belakoba Co-operative Multipurpose (Jute Sale) Society, it fared better and the share capital increased from Rs. 1522/- to 1724/8/- during the period under review. The Society commenced its business from the 7th August 1946 and as stated before continued to operate till the 28th February 1947 after which the financial assistance from the Society was withdrawn by the Indian Central Jute Committee in pursuance of the decision at the meeting held in January, 1947 to that effect. The business was however seriously affected on account of non-receipt of the usual working capital from the Government of Bengal. This financial difficulty was however partially overcome by the payment of a temporary advance of Rs. 2000/- by the Indian Central Jute Committee.

11. The following statement will give an idea of the progress of work of the Belakoba Jute Sale Society :—

Items.	1945-46 Season (Up to 31-3-46)	1946-47 Season (Up to 28-2-47)
1. Quantity of jute purchased	2,480 mds.	3027 mds.
2. Quantity of jute sold ...	2,319 ,,	2985 ,,
3. Stock left	124 ,,	-Nil
4. Loss in dryage etc. ...	37 ,, (1·5%)	42 ,, (1·39%)
5. Total value of jute purchased	Rs. 27,564	Rs. 69,661
6. Total value of jute sold ...	,, 26,632	,, 71,588
7. Estimated value of stock ...	,, 1,588	.....
8. Gross profit (+) or Loss (−) as per Trading Account ...	,, (+) 656	,, (+)1,927
9. Subsidy paid by I. C. J. C....	,, 2,647	Rs. 3,520*

*Of this, the sum Rs. 1335/- is outstanding.

12. It will appear from the above statement that the Society recorded a good progress during the current season and earned a trading profit of Rs. 1927/- as against Rs. 656/- in the corresponding period of 1945-46. The improvement in the loyalty of members was significant, 129 members having supplied about 85 per cent of the total jute purchased by it as against 90 members supplying 75 per cent in the previous year.

13. Purchases and sales on estimation basis being the local practice, only 13 per cent of the purchases was made on assortment basis, while about 15 per cent. of the sales were effected on the same basis as most of the jute was sold to the local Marwari firms who offered better prices.

14. A comparative statement showing the details of working of the two societies during the 1944-45 and 1945-46 seasons is given below :—

Items.	Sarisabari Society		Belakoba Society	
	1944-45 Season	1945-46 Season	1944-45 Season	1945-46 Season.
1. Quantity of jute purchased ...	3,141 mds.	6,787 mds.	992 mds.	2510 mds.
2. Quantity of jute sold	3,028 ,,	6,658 ,,	978 ,,	2471 ,,
3. Stock left ...	57 ,,	Nil	Nil.	Nil.
4. Loss in dryage etc. ...	56 ,, (1·8%)	129 ,, (1·9%)	14 ,, (1·4%)	39 ,, (1·55%)
5. Total value of jute purchased ...	Rs. 37,168	Rs. 78,586	Rs. 10,676	Rs. 27,950
6. Total value of jute sold	,, 36,619	,, 78,754	,, 10,983	,, 28,668
7. Total value of stock	,, 663	...	...	...
8. Gross profit (+) or loss (—) as per Trading Account ...	,, (+) 114	,, (+) 168	,, (+) 307	,, (+) 718
9. Net profit (+) or loss (—) as per Profit and Loss Account of the audited statement ...	,, (+) 51	Statement not received	,, (+) 427	,, (+) 818
10. Total subsidy paid and due by I.C.J.C.	,, 5,143	,, 7,132	,, 2,181	,, 4,257

15. It will be evident from the above statement that the Belakoba Jute Sale Society's progress during 1945-46 season was much better than that of the 1944-45 season. Further, from a comparison of result of 1945-46 season with that of the 1946-47 season as given in one of the foregoing paragraphs, it will appear that the said Society had done immensely well which however is attributed to favourable market conditions during the season particularly from October onwards. Fairly good support was received from the local balers and only one firm in each locality paid brokerage to the respective Societies on account of the jute supplied to them.

II. *Organisation of Co-operative Transport and Collective Sales*

16. According to the previous decision of the Indian Central Jute Committee, provision was made in the budget for the organisation of Co-operative transport and collective sales at the Sarisabari centre only instead of at Akhaura, Belakoba and Sarisabari centres as in the previous years. This was done with a view to encouraging loyalty from the members of the Sarisabari Co-operative Multipurpose (Jute Sale) Society. But as the business of the said Society was closed down by the middle of August, 1946, no co-operative transport could be arranged by the staff of the Society.

III. *Grading of Jute by peripatetic Grading Parties*

17. Each of the three Grading Parties continued to operate as before in the Sarisabari (Mymensingh), Akhaura (Tippera) and Belakoba (Jalpaiguri) areas on all-year basis. The main object of the scheme was to teach the growers how to grade jute into recognised commercial standards. The results of grading also provided an opportunity for studying the seasonal variation in quality of jute and also the growers reaction to the propaganda made in fa vour of selling on assortment basis.

18. Although the parties were to operate on all-year basis, the actual grading operations were confined to the period mentioned below against each—the remaining period being utilised

in carrying on propaganda regarding preparation of fibre, grading etc.

Sarisabari Grading Party — 1st July 1946 to 31st Jan. 1947.
Akhaura ,, ,, — 1st July 1946 to 22nd Feb. 1947.
Belakoba ,, ,, — 1st Sept, 1946 to 28th Jan. 1947.

In Northern Bengal, jute is sown late and is therefore ready for harvest at a much later date than in the Eastern Bengal. Consequently, the Belakoba Grading Party commenced its grading operations on the 1st September, 1946.

As before advance propaganda was made both by the District Agricultural staff and the Grading Party in the areas that were to be covered by them.

19. A comparative statement showing the progress of work made by the three parties during the current and the previous seasons is given below :—

	Sarisabari		Akhaura		Belakoba	
	1945-46 season (up to 31-3-46)	1946-47 season (up to 31-1-47)	1945-46 season (up to 31-3-46)	1946-47 season (up to 22-2-47)	1945-46 season (up to 31-3-46)	1946-47 season (up to 28-1-47)
No. of villages visited ...	91	102	61	54	294*	168*
No. of growers whose jute was assorted ...	799	1,160	802	561	972	510
Total quantity of jute assorted (in mds.)...	8,529	7,202	9,602	7,426	5,700	2,663
Grade outturn (in percentage)						
Top	nil	3·20	2	17·70	nil.	1·60
Middle ...	28	49·70	66	71·80	49	50·0
Bottom ...	67	44·80	32	10·0	47	40·50
X	5	2·30	nil	·50	4	7·90

*Indicates undefined areas and not regular villages.

20. The output of work in the Belakoba area during 1946-47 was much smaller than that in 1945-46. The reasons were (*i*) 3 assorters worked during the current year as against 4 in

the previous year, (*ii*) suspension of work for some days due to inclemency of weather and, (*iii*) lack of proper supervision on account of the resignation of the supervising clerk towards the latter part of the period. It will further appear from the above statement that the grade outturn of jute as obtained during the period under review was better than the previous corresponding period. The improvement in quality in the Belakoba area was not however as marked as in the other two areas, the quality there being affected on account of continuous rain at the time of preparation of fibre which interfered with timely drying. The growers took considerable interest in the work and in many cases they themselves graded some of their jute.

21. It appeared from a comparison of the average prices as received by growers for unassorted jute with that received for their jute sold on grade basis that they were gainer by 5 to 6 annas per maund in the latter method of selling.

22. All the Grading Parties were disbanded on the 28th February, 1947 in pursuance of the decision of the Indian Central Jute Committee at its last January meeting and we approached the Government of Bengal with the request to take them over. It has been learnt that they have accordingly decided to take them over and will reorganise them in such manner as they like.

IV. *Dissemination of Calcutta Loose Jute Prices*

23. As in the previous year, the dissemination of Calcutta loose jute quotations was confined to Assam, Bihar and Orissa during the period under review. In Bengal, price cards were however sent to the Indian Central Jute Committee's staff at Sarisabari, Gangasagar and Belakoba with a view to keeping them well posted with the trend of market so that they could advise the growers accordingly. Quotations were collected daily from two well-reputed brokers' firm and were disseminated to the destinations by ordinary post through the Committee's Publicity Department. The Provincial Governments concerned made their own arrangement at the other end for necessary

publicity. The number of centres supplied with the information is as shown below :—

Assam	...	21
Bihar	...	9
Orissa	...	4
Total		34

24. It may, however, be noted that price cards were sent out bi-weekly to Orissa and 5 centres each in Assam and Bihar upto the middle of September. Later, price cards were despatched to all the centres ; but instead of sending them daily they were sent out on bi-weekly basis till the third week of October, 1946. However, as the prices began to fluctuate on account of decontrol of jute prices after the 30th September, 1946, cards were sent on daily basis from the 21st October.

V. *Marketing of fibre grown from Improved seed.*

25. As in previous seasons, 9 maunds of D. 154 and 1 maund of C. G. strains of jute seed were distributed among selected growers of Sarisabari, Gangasagar and Belakoba areas. The object of the scheme was to demonstrate to them the superiority of the departmental varieties to the local ones in respect of both quantitative and qualitative outturns. The above seeds were purchased from A. L. Godden, Agent for Government jute seeds at Rs. 52/8 and 62/8 per maund respectively for D. 154 and C. G. and were sold to a few selected jute growers at concessional prices of annas 8 and 10 per seer respectively. Further details of distribution are shown below :—

Name of Centre.	No. of growers to whom seed was distributed.	Net quantity distributed.	Area sown (in acres)	Seed rate (in seers per acre)
		Md. Sr.		
Gangasagar	42	3 0 (D. 154)	25·5*	4·7
Sarisabari	36	2 21 (D. 154	18·68	5·4
		0 38 (C. G.)	8·36	4·5
Belakoba	36	2 34½ (D. 154)	24·4	4·7

*Of this 2·5 acres were completely damaged by heavy rains.

26. Some compact blocks were formed in the three areas and the departmental seeds were sown in them and necessary interculture etc. were given under supervision of the Committee's District Agricultural Staff. Side by side, some check plots grown with local seed were kept under observation. These as well as the experimental blocks received similar treatments and were sown and harvested on the same day.

27. The comparative statements (on pages 11 and 12) give all necessary particulars regarding yield, grade outturn etc.

While weather conditions were more or less favourable to the normal growth of the experimental blocks in the Gangasagar and Belakoba areas, the blocks in the Sarisabari area were affected at the early stage of the crop by continuous and heavy rainfall which interfered with intercultural operations. This resulted in a low grade outturn in the Sarisabari area. It would further appear from the above statement that both yield and grade outturn from the departmental crops were significantly better than that of the local crops and as such, the growers were benefitted to a considerable extent. The local District Agricultural Staff rendered assistance to some of them in marketing their fibre.

VI. *Study of Indian Market with a view to increase the consumption of Jute and Jute Goods*

(Survey of Cottage Industry in Jute)

28. The above survey was confined to the survey of cottage industry only in accordance with the previous decision of the Indian Central Jute Committee in the matter. Accordingly, a short and localised survey was undertaken within the areas of operation of the Co-operative Jute Spinning and Weaving Societies at Domar (Rangpur) and Setabganj (Dinajpur).

29. The cottage industry in jute so far as the Rangpur and Dinajpur districts are concerned is confined to the Domar P. S. in the former and the Thakurgaon Sub-Division in the latter. The industry is found as a part-time occupation of the women folk of the Pulia tribe. The implements used are simple and primitive and among the goods produced by the weavers, 'fatiya'

	Gangasagar		Sarisabari		Belakoba	
	D. 154	Local	D. 154	Local	D. 154	Local
WHITE JUTE						
Area under observation and harvested for fibre (in acres)	23	11·5	18·63	17·76	21·4	5·8
Total outturn (in maunds) ...	397·5	117	320	273·75	402·75	83·5
Yield per acre ,, ...	17·3	15·4	17·2	15·4	18·8	14·4
Quantity of jute assorted (in maunds) ...	377	176·5	320	273·75	352	68·5
Grade outturn in percentages						
Top	40	30	.....	.....	1·5	.....
Middle	54	60	44	39	57·5	41
Bottom	6	10	54	58	36·0	46
X	.....	.....	2	3	5	13

	Sarisabari	
	C. G.	Local
TOSSA JUTE		
Area under observation (in acres)		
Total outturn (in maunds)	8·36	6·20
Yield per acre (in maunds)	185·5	118
Quantity of jute assorted (in maunds)	22	19
Grade outturn (in percentages)	185·5	118
Top	...	...
Middle	72	54
Bottom	27	43
X	1	3

(Hessian strip) is the most important. This is a loosely woven coarse cloth measuring 45″ to 60″ in length and 28″ to 32″ in breadth and has a commercial demand in the cotton markets of Bombay, C. P. and Berar as a packing material for loose cotton—4 to 5 pieces being used for 2 to 2½ mds. of cotton. They are known as *Bengal Bardana* in those localities.

30. As the demand for 'fatiya' during the recent years appeared to be very much limited it was considered necessary to explore some of the markets with a view to increasing the demand so that the Co-operative Jute Spinning and Weaving Societies will ultimately benefit. Therefore, the Marketing Officer visited Bombay, Nagpur, Akola, Jalna and Indore and contacted some parties interested in this trade. The fall in the demand for 'fatiya' and their dependence on old gunny bags was however attributed to the following reasons :—

(1) High price of 'fatiya'

(2) Transport difficulty

(3) Cheapness of old gunny bags

(4) Storage of pressed cotton by Ginning and Pressing firms as against the storage of loose cotton in the past.

Although the prospects of increasing its demand did not seem to me to be impossible, it appeared that unless certain improvements were made and the sizes were standardised we could not make much headway.

VII. *Co-operative Societies of Cottage workers in Jute Spinning and Weaving*

31. Mainly with the object of encouraging production of jute goods of various types as a spare-time occupation for the agriculturist and their women folk, two Co-operative Jute Spinning and Weaving Societies one each at Domar (Rangpur) and Setabjanj (Dinajpur) were organised in February, 1946. Both the Societies are yet at the organisational stage, members being still enrolled and share money collected. The Manager of the former Society joined in early August 1946, while the Manager

of the latter joined his duties in mid-November, 1946, Therefore, the work of these Societies did not progress satisfactorily. Efforts were made to fill up the posts of supervisors (technical); but it has not yet been possible to do so. Two candidates were however selected recently and it is expected that they will take up their duties soon.

32. The following statement will show the progress made so far by the two Societies :—

	Members enrolled	Share money collected	Admission fee collected
Domar Society ...	394(*a*)	Rs. 442-0-0	Rs. 166-0-0
Setabganj ,, ...	288(*b*)	Rs. 265-0-0	Rs. 130-0-0

(*a*) 31 members have not paid their admission fees and share money.

(*b*) 28 members have not paid their admission fees and share money.

33. The Government of Bengal was approached with the request to advance the sum of Rs. 5,000/- (Rupees five thousand) to each of these Societies as working capital which they had sanctioned. But as the funds were not required by them during the year, none of the Societies availed of the loan. The Domar Society, however, was in need of some funds before the sanction of the Government loan was communicated. Therefore, the Indian Central Jute Committee granted a temporary advance of Rs. 1,000/- towards its working capital in order to enable it to tide over the financial difficulty. With these funds, the Domar Society managed to do some business, the extent being negligible. It purchased 2684 pieces (about 61 mds.) of *fatiyas* (Hessian strips) both from members and non-members at a total cost of Rs. 1058-13-0. They were sold locally in January, 1947, at Rs. 17/8/- per maund and the total sale proceeds amounted to Rs. 1067-15-0. Thus a small trading profit of Rs. 9/2/- was made. The temporary advance paid to the Society by the Indian Central Jute Committee was duly repaid by it.

34. A conference was held in December, 1946, at Jalpaiguri with a view to discussing methods of proper and efficient working of the Jute Sale Societies and the Jute Spinning and Weaving Societies. The conference was attended by the Director of Agricultural Marketing, Bengal, Dy. Director of Industries (Development), Bengal and the Assistant Registrar of Co-operative Societies, Rangpur besides the Secretary and the Marketing Officer of the Indian Central Jute Committee. Among others, some important decisions in respect of the latter societies emerged out of the discussions and they are now being followed up. It is expected that all preliminary arrangements will be completed before the actual business transactions of the two Societies are taken up in the coming season.

VIII. *Collection of Jute Prices and other Statistics from mofussil areas in Bengal.*

35. The above scheme was given effect to in October, 1945, with the object of studying the price spread and to arrive at a reliable price structure from the village to the terminal market. Its term which was sanctioned in the first instance up to March, 1946, was extended for another year by the Indian Central Jute Committee at its meeting held in July, 1946, as the data collected till that time was considered too inadequate for any statistical analysis.

36. According to this scheme 12 *hats* or markets were selected within the 'pull' of the Sarisabari market. 2 villages within the radius of 4 or 5 miles were also linked to each of the selected 12 places as well as Sarisabari and information regarding price, grade outturn etc. was collected by the two Investigating Assistants appointed for the purpose. The data collected by them were put to preliminary examination and tabulated in the Marketing Section before passing them on to the Economic Research Section for statistical analysis.

The scheme was transferred to the Economic Research Section in February last in accordance with the decision of the Indian Central Jute Committee at its last January meeting to that effect.

IX. *Miscellaneous*

37. The Marketing Section attended to various matters relating to the Jute Grading schemes in Assam and Bihar and

also to the Co-operative jute marketing scheme in Orissa. As regards the former, separate reports are expected from the provinces concerned and therefore no details regarding them are given in this report. But as regards the Co-operative marketing scheme in Orissa, a report for the season is due for consideration in the next January meeting and therefore a brief report on the progress of the scheme is given below :—

	No. of members	Quantity supplied to the Society by them
Kendupatna Society ...	525	3,534 mds.
Danpur ,, ...	436	8,454 ,,
Marshaghai ,, ...	171	3,319 ,,

38. It will appear from above that the total quantity of jute sold through the three Societies was 15,307 mds. In the previous season 6,581 mds. only were sold through the same. It may however be noted that out of 15,307 mds. a considerable quantity of non-members' jute was sold through the members of the Societies or, in other words, some members acted as *baparis*. The buyers of the Societies' jute were Messrs. Sinclair Murray & Co. and Krishna Jute & Cotton Mills. All the sales were effected on estimation basis as it was not possible for the buyers to allow space for grading. The Marketing Officer paid a visit to these areas towards the end of January, 1947, and he felt that the prices received by growers were not unsatisfactory.

39. As regards village grading of jute, in all 778 mds. were graded by the temporary grader the grade outturn being as follows :—

	Top	Mid.	Bot.	Black Bottom
Kendupatna ...	...	3	80	17
Danpur ...	...	7½	67½	25
Marshaghai ...	...	...	75	25

The quality of the crop in general was found to be inferior to that of the previous crop.

40. As in the past, three-fourths of the expenditure of the scheme were borne by the Indian Central Jute Committee and the remaining one-fourth by the Provincial Government.

41. Informations regarding jute prices as prevailed in the above mentioned provincial centres of activities were collected from the local staff and are being tabulated for publication in the *Jute Bulletin*.

42. Jute prices were also collected as before from the Sarisabari (Mymensingh), Akhaura (Tipperah) and Jalpaiguri markets through the Committee's staff for publication in the Jute *Bulletin*. A monthly review of the Indian Jute market was published by the Section in the *Bulletin* throughout the period under review. Miscellaneous enquiries received from various quarters from time to time were attended to as before.

X. *Acknowledgements*

43. The Section is grateful to the various officials of the Government of Bengal, Bihar, Assam and Orissa for their Co-operation in working out smoothly the schemes implemented in the respective provinces. Thanks are due to numerous balers of whom mention may be made of Messrs. Landale & Clark Ltd., Sinclair Murray & Co., Ralli Bros. and Bengal Haworth & Co who helped us in every possible way in conducting the schemes in the upcountry. The Section is also indebted to Messrs. J. Thomas & Co., (Jute & Gunnies) Ltd. and B. Adhikary & Co. and H. D. Cartwright & Co. for supplying the market quotation regularly. The staff of the Section posted at the headquarters and in the *mofussil* worked sincerely.

S. M. GUPTA,
Offg. Marketing Officer.

APPENDIX

Programme of work for 1946-47	Progress made	Future work
I. Experimental Co-operative Jute Sale Societies in Bengal. (The Society at Sarisabari is to work on new lines in accordance with the modified scheme. The Belakoba Society is to continue as at present).	While the Belakoba Co-operative Multipurpse (Jute Sale) Society made good progress (*vide* page 4 of the report) the work of the Sarisabari Co-Operative Multipurpose (Jute Sale) Society had to be closed suddenly as a result of defalcation of its funds by the staff. The Marketing Officer inspected the work of departmental investigation from time to time and kept the Local Sub-Committee informed about the progress. The police investigation which commenced in last October is proceeding and is yet incomplete. The miscreants are said to have been enlarged on bail. A comprehensive report on the matter was placed before the I.C.J.C. at its last January meeting.	The Indian Central Jute Committee decided at its meeting held in January, 1947 that the financial and other assistance should be withdrawn from the two experimental Co-operative (Jute Sale) Societies. Therefore, there will be no work in future in this connection.
II. Organisation of Collective Sales and Co-operative Transport.	The Sarisabari Society's work having been stopped in early August, 1946—no co-operative transport was organised.	The Committee decided that as the Sarisabari Society is not to function, there was no necessity for continuing the work.

APPENDIX—*Contd.*

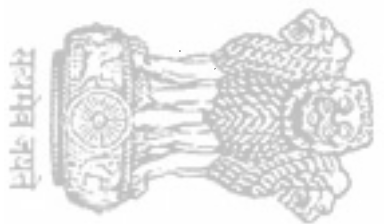
Programme of work for 1946-47	Progress made	Future work
II—*Contd.* (The Indian Central Jute Committee recommended that this should be confined to the Sarisabari centre only).		
III. Grading of Jute by peripatetic Grading Parties.	The three Grading Parties at Sarisabari (Mymensingh), Gangasagar (Tipperah) and Belakoba (Jalpaiguri) continued to operate till the end of February, 1947 and the progress of work made by them was satisfactory (*vide* page 7 and 8 of the report). Pursuant to the I.C.J.C.'s decision the three Grading Parties were disbanded on the 28th February, 1947 and the Govt. of Bengal was approached with the request to take them over.	As the Grading Parties have already been disbanded, there will be no work on this scheme in future.
IV. Dissemination of Calcutta Loose Jute Prices.	In accordance with Indian Central Jute Committee's previous decision in the matter, prices were disseminated to 34 centres in Assam, Bihar and Orissa.	To continue as at present.

V.	Marketing of fibre grown from Improved Seed.	9 mds. of D. 154 and 1 md. of C.S. seeds were distributed among selected growers in the vicinity of Sarisabari, Gangasagar and Belakoba and the quantitative and qualitative outturns obtained from these were compared with that obtained from check plots growing local crop (for details see pages 9 to 12 of the report).	The Indian Central Jute Committee at its last January meeting decided that this scheme should be discontinued.
VI.	Studying of Indian Market with a view to increase the consumption of Jute and Jute goods. (The enquiry is to be pursued and an effort made to collect as much information in the Jute cottage industry as possible).	A report on the progress was incorporated in the previous Annual Report of the Section. Further information has since been collected from the Domar and Setabganj areas. Information regarding the consumption of 'fariyas' (Hessian Strips) was also collected by the Marketing Officer from some consuming centres in Bombay, C.P. and Berar etc.	The Indian Central Jute Committee at its last January meeting decided that the scheme should be transferred to the E.R. Section. However, collection of further information on jute cottage industry is contemplated in future (*vide* Appendix – see IX (d)).
VII.	Co-operative Societies of Cottage Workers in Jute Spinning & Weaving.	The two Societies which were organised at Domar (Rangpur) and Setabganj (Dinajpur) made some progress during the period under review. The posts of Supervisors could not be filled up as yet for want of suitable candidates. Some business was done by the Domar Society.	Necessary steps for furtherance of the work of these Societies on proper lines are being taken on hand. Proper arrangements for the disposal of the Societies' jute goods will have to be arranged for so that they can establish themselves well.

APPENDIX—*Contd.*

Programme of work for 1946-47	Progress made	Future work
VIII. Collection of Jute Prices and other statistics from mofussil areas of Bengal.	The scheme was continued in the Sarisabari centre and further data collected and passed on to the E.R. Section after necessary tabulation.	This scheme has also been transferred to the E.R. Section in pursuance of the Indian Central Jute Committee's decision at its last January meeting.
IX. Miscellaneous.		
(a) Collection of Jute Prices from Sarisabari, Akhaura and Jalpaiguri for publication in the Committee's *Bulletin*.	Information was collected, tabulated and passed on to the E.R. Section after examination for publication in the *Bulletin*.	This is to be continued and the information collected thorugh the District Agr. staff posted at these centres.
(b) Publication of the monthly Review of Indian prices for jute in the *Bulletin*.	This was done regularly.	This is to be continued.
(c) Collection of Jute Prices from Bihar, Assam and Orissa for publication in the *Bulletin*.	Information has been collected and the Statistics are being tabulated.	Tabulation of the statistics and collection of further information.

(d) Survey of the jute cottage industry located in the principal centres.	A survey was made in the Domar and Setabganj areas and a short note on the results submitted to the Secretary.	This is to be pursued and further information collected by the local staff in course of their work.
(e) Study of Bombay, Hyderabad (Deccan), C.P. and Berar markets with reference to the consumption of 'hessian strips', produced in Bengal on cottage industry basis.	The Marketing Officer visited certain markets and made exploratory enquiries and a note on the same submitted to the Secretary.	No further work contemplated.



APPENDIX IV

ANNUAL REPORT OF THE ECONOMIC RESEARCH SECTION FOR THE YEAR 1946-47.

The year under review was marked by a further rapid expansion of the research activities of the section. It was, however, extremely difficult to cope with the increased volume of work owing to the disturbances in Calcutta and Eastern Bengal which seriously hampered the activities of this section. Besides, a number of old and experienced assistants left the services of the Committee during the year for better posts elsewhere. On account of the disturbances, there was also considerable delay and difficulty in filling up the vacancies and in recruiting the staff necessary for the additional work undertaken by the section. Consequently, the work of the section did not progress as smoothly as would have been possible under normal conditions. In spite of these difficulties, however, the programme of work for the year under review was fulfilled to a very large extent.

The Indian Central Jute Committee at its meeting held in January 1946, approved the following programme of work for the Section for the year 1946-47 :—

(1) Preliminary investigation into the economics of jute growing (2nd year) ;

(2) American market for jute and jute goods ;

(3) Revision of the study of world consumption of jute ;

(4) Excess productive capacity of jute mills ;

(5) Brochure on jute statistics.

Two other items were later on added to this programme, namely,

(6) Study of Mofussil prices of jute and other statistics ;

(7) Statistical analysis of Prof. Sen Gupta's data on physiology of jute.

A brief summary of the work done during the period under review is given below.

INVESTIGATION INTO THE ECONOMICS OF JUTE GROWING

The purpose of this investigation was briefly stated in the last Annual Report. Investigation was begun in 1945, and continued during the year under review. A full report of the first year's work was placed before the Committee at its meeting held in July, 1946. Three typical jute-growing villages were chosen in the districts of Dacca, Rangpur and Jessore and a number of farms selected in each village for investigation. The actual method of investigation has been described in the report. The experience of the first year's work proved that the technique of investigation adopted in the pilot enquiry was basically sound. It was, however, necessary to intensify the enquiry at each centre as well as to extend it over wider areas and to collect larger samples than were obtained in the first year. The report also gave details of the results obtained from the enquiry. Although the investigation was of a preliminary nature to explore the possibilities of such an enquiry, important conclusions were drawn from the experience of the first year's investigation.

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On the basis of this report, the Committee decided that the investigation should be continued at the three centres already selected during the year 1946 and that in 1947, it should be extended to two more centres with a larger number of farms at each centre. Originally the field staff consisted only of one Senior Investigator at each centre. But in the second year, the Senior Investigators were given one farmer assistant each, so that they could collect data plot by plot instead of for the farm as a whole. The total number of plots under investigation at the three centres was over 200. A detailed report of the second year's work will be placed before the Committee at its meeting to be held in July, 1947.

According to the decision of the Committee, two new centres were opened early in 1947, one in the Mymensingh District and

the other in the Faridpur District. In order to make the enquiry more representative, the number of farms selected at each of the five centres for study was raised from twenty to fifty. The technique of selection was also improved by the adoption of "stratified sampling". This is expected to improve the reliability of our conclusions. This year also investigators have been instructed to record field operations plot by plot, so that it will be possible to estimate the variation of cost within each farm. To cope with the increased scale of work, the field staff has been augmented by the addition of two Junior Investigators at each centre.

AMERICAN MARKET FOR JUTE AND JUTE GOODS

This study was undertaken to explore the nature of the demand for jute in the United States. The data available here were not as adequate as one would desire. However, a report has been prepared outlining structure of the important jute market in U. S. A. and discussing the basic forces that govern demand within it. The report gives an insight into the working of the American market and, it is hoped, will prove valuable to the trade. It is ready for publication, pending the supply of adequate paper by the Stationery Office.

REVISION OF THE STUDY OF WORLD CONSUMPTION OF JUTE

A Research Bulletin on World Consumption of Jute was published by the Economic Research Section in 1941. It was based on data for the period from 1933-34 to 1939-40. It could not be brought up to date during the war as relevant data were not available at that time for security reasons. In the second issue of this bulletin, earlier data have been revised and new data, as far as available, have been incorporated. The revised edition is in course of publication.

EXCESS PRODUCTIVE CAPACITY OF JUTE MILLS

The original plan of work on this subject was described in the last Annual Report. The method of enquiry outlined there had to be given up as the necessary data were not forthcoming

from the Indian Jute Mills Association. An attempt was then made to study the problem on the basis of data contained in the balance-sheets and statements of accounts of a few representative mills. The report on the subject was completed in December, 1946 and placed before the last January meeting of the Committee. In this report cost of production of eight jute mills was analysed to see how far costs were governed by the size of output. It was found that unit costs varied from year to year, but the variation did not seem to be in any manner related to changes in output. The report further considered the measure and significance of excess capacity in the Indian Jute Mill Industry.

BROCHURE ON JUTE STATISTICS

This brochure is a collection of all important statistical data on jute as far as available at present. As the original tables are by themselves not often very helpful to the layman; summary tables have been prepared indicating the salient features of jute trade and industry. The first draft of the brochure is expected to be ready soon.

STUDY OF MOFUSSIL PRICES OF JUTE AND OTHER STATISTICS

The present study was undertaken jointly by the Economic Research Section and the Marketing Section of the Committee. The plan of work was evolved jointly by the two Sections but the collection of data was done by the Marketing Section while the statistical analysis and interpretation of data was left to the Economic Research Section.

Thirteen secondary markets or hats were selected within the "pull" of Sarisabari market in the Mymensingh District. Twenty-six villages linked up with these were also chosen. Various data on prices, arrivals, stocks and grade outturn etc. were collected both at the primary and secondary markets, some at fortnightly and others at monthly intervals. Collection of data began from October, 1945.

At the meeting of the Committee held in January, 1947, it was decided that the scheme should be handed over entirely to the Economic Research Section and that it should be extended to the

five centres where investigation into the economics of jute growing were being carried on.

The data relating to the Sarisabari area have been analysed and a report on it will be submitted at the July meeting of the Committee. Steps have also been taken to give effect to the scheme at the other five centres.

ANALYSIS OF DATA ON PHYSIOLOGY OF JUTE

In August 1946, Prof. J. C. Sen Gupta approached the Director of Economic Research for statistical analysis of his experimental data on physiology of jute. The staff necessary for the work was not available till November, 1946. The data relate to the following experiments :—

(1) Time of sowing experiment (I)

(2) Time of sowing experiment (II)

(3) Nutrition experiment (I)

(4) Nutrition experiment (II)

(5) Deficiency experiment

(6) Vernalization experiment

(7) Photo periodic-effect experiment (I)

(8) Photo periodic-effect experiment (II)

The statistical work mainly consists of analysis of variance of over two hundred tables. The work is still in progress and an interim report on it will be placed before the July meeting of the Committee.

MISCELLANEOUS

The following notes were prepared during the period under review :—

(1) A note on jute acreage in Bengal for the Planning Sub-Committee.

(2) A note for the Jute Grading Sub-Committee.

(3) Several notes in reply to enquiries made by Government.

Dr. W. E. Deming, PH.D., Adviser in Sampling, Bureau of the Budget, U. S. Government, paid a visit to this Section and discussed with the Director of Economic Research and the Statistical Officer the method of sampling and other problems relating to the field work of the Economic Research Section.

PROGRAMME OF WORK

The Committee at its meeting held in January 1947 approved the following programme of work for the Economic Research Section :—

1. Investigation into the economics of jute growing.
2. Study of Mofussil prices of jute and other statistics.
3. Statistical analysis of data on the physiology of jute.
4. Study of secular, cyclical and seasonal variations of important jute statistics.
5. Study of the British market for jute and jute goods.
6. Study of the Indian market for jute goods.

The Committee also suggested that an amended programme might be placed before the next meeting of the Committee, if the Director, Economic Research, experienced difficulty in implementing all the items.

ACKNOWLEDGEMENTS.

The Director, Economic Research, takes this opportunity to express his thanks to the Government Trade Commissioners, the Indian Jute Mills Association, Messrs. J. C. Duffus & Co., and various other trade bodies and associations for their valued co-operation in all matters bearing on the research activities of the Section. He also wishes to record his appreciation of the willing co-operation of the staff of this Section who had to work under great strain during the difficult period under review.

D. GHOSH,
Director, Economic Research.
6-6-47.

APPENDIX.

Programme of work for 1946-47.	Progress.	Future work.
1. Investigation into the Economics of Jute Growing.	Report on the second year's work is under preparation. In the third year the investigation has been extended to two more centres, making a total of 5 centres. The number of farms at each centre has been increased from 20 to 50. Data are being collected for each plot. Work is well under progress.	The method of estimating cost of production of jute and other related items may be improved if the investigation is carried out at least for one complete agricultural cycle. It should, therefore, be continued for two more years.
2. American market for raw jute and jute goods.	The structure of the American market for jute and jute goods has been studied as fully as possible with available data. The study will be published soon in the form of a brochure.	A much fuller study of the subject can be made if opportunities are given to gain first hand knowledge of the American market.
3. World consumption of jute.	The revised brochure is now ready for publication.	This publication should be revised and brought up to data from time to time.
4. Excess productive capacity of jute mills.	As it was not possible to elicit detailed information on the subject from the Indian Jute Mills Association, a study was made on the basis of data contained in balance sheets of jute mills. A report on the subject was placed at the meeting of Indian Central Jute Committee held in January, 1947.	.....

Programme of work for 1946-47.	Progress.	Future work.
5. Brochure on jute statistics.	Both detailed and summary tables are being prepared. First draft is under preparation.	After its first publication the brochure should be revised and brought up to date at regular intervals.
6. Mofussil prices of jute and other statistics.	The scheme was originally carried out jointly by the Economic Research and Marketing Sections. Since January 1947, however, it has been entirely taken over by the Economic Research Section. A report on the first year's work is under preparation.	The scheme has been sanctioned up to July 1947.
7. Statistical analysis of Prof. Sen Gupta's data on physiology of jute.	The work was taken up in November 1947, and nearly half of it has been finished. It is expected that a statistical report on the data will be ready by September, 1947.	.....

APPENDIX V

ANNUAL REPORT OF THE PUBLICITY SECTION FOR THE YEAR 1946-47

1. During the year 1946-47 the Publicity Section, which continued to be in charge of Mr. K. I. A. Quaderi, the Publicity Officer, was engaged with work under the following broad heads :—

(*a*) Production and Distribution of the Committee's monthly journal, the *Indian Central Jute Committee Bulletin*, and selling of space to advertisers therein ;

(*b*) Sale and Distribution of Indian Central Jute Committee Publications ;

(*c*) Press Propaganda ;

(*d*) Price Dissemination Service (in collaboration with the Marketing Section) ; and

(*e*) Work in connection with the establishment of a Central Jute Museum.

2. It is not a little gratifying to note that in spite of abnormal conditions prevailing during most of the period under review steady progress has been maintained in the work of the Publicity Section.

3. The Committee's monthly journal, the *Indian Central Jute Committee Bulletin* has continued to be produced every month.

4. To the summary of the contents of the Bulletin sent out by the Publicity Section every month to the Press of the country and overseas also, encouraging publicity has continued to be given by important home and foreign journals alike and important items of information in the *Bulletin* are thus being disseminated to an international circle of readers.

Circulation of the "Bulletin"

5. *The Indian Central Jute Committee Bulletin* was brought into being mainly in response to the demand of the jute trade for an authoritative regular periodical giving all available authentic information on jute and substitute fibres and also to function as a vehicle for the regular dissemination of information on the subject of research activities carried on in the different technical Sections of the Committee. During the first few years following its birth, the *Bulletin* used to be distributed free but later as demand for the journal gradually increased the Committee at the suggestion of the Publicity Officer decided to convert the *Bulletin* into a priced publication of the Committee—this was in 1941. The result of course was an immediate fall in its circulation figure which was, however, not beyond what was expected. But the informative value of the *Bulletin* could not long be missed by the interested public, and a steadily growing response from them has since been obtained.

6. It is a further point of gratification to note that progress has been steadily maintained in its circulation inspite of the fact that the conversion of the *Bulletin* into a priced publication coincided with the war which acted adversely on many a well-established journal. Requisitions for the *Bulletin* are being received from the U. S. A., South Africa and Egypt since the end of the war. This bears testimony to the fact that even in its present poor state, with regard to get-up and display, the *Bulletin* has not only an inland demand, but overseas also.

Editorial Board.

7. It was all along felt that to bring up the Committee's journal to the level of the other journals of the type improvement of the *Bulletin* was very necessary. But work in this connection had to be held up so long owing to the restrictions of the 1939-45 War and the civil strife coming in its wake. Now, however, the serious attention of the Publicity Section is being paid to the all-round improvement of the *Bulletin*, and as a first important step towards it an Editorial Board has been set up during the period under review. The Board consists of the Vice-President, the Secretary and the five Sectional Heads of the Committee, with

the Publicity Officer as the Managing Editor. The Board has held some meetings and a few proposals for the improvement of the *Bulletin* have been decided upon. These are expected to be given effect to as soon as normal life, which still continues to remain dislocated owing to the unfortunate communal strife, returns to the city.

8. With effect from the April 1947 issue of the *Bulletin* the Editorial Board has decided to change the name of the journal from BULLETIN to JUTE BULLETIN.

Advertisement in the Bulletin.

9. Advertisements booked up to the end of March, 1947, amount to Rs. 1170/- in value (gross).

Press Propaganda.

10. Twenty-three Press Notes and Unofficial Notes were issued during the period under review, dealing with a variety of subjects and considering the support obtained from the Press inland and overseas in so far as they published the said notes either *in toto* or in part, the progress with regard to Press Propaganda may be regarded as satisfactory.

Some of the subjects dealt with were :—

(*i*) Scarcity of Jute-Bag in Cuba.

(*ii*) U. S. Burlap Consumption.

(*iii*) Indian Hessian—Purchases by U. S. Government.

(*iv*) Sugar Storage Problem Tackled by Research in India.

Radio Publicity.

11. The Calcutta Station of All-India Radio has continued to extend its help and co-operation in the work of this Section by broadcasting extracts from our *communiques* on important occasions.

Price Dissemination Service.

12. The work in this connection, as usual, has been carried on in collaboration with the Marketing Section, by passing on the daily quotations of the Calcutta Raw Jute Market received from

the Marketing Section, to 36 centres in Bihar, Orissa and Assam by post. Details will be found in the report of the Marketing Section.

Sale and Distribution of Publications

13. The total number of the Indian Central Jute Committee publications other than the *Bulletin*, sold and distributed free within the period under review number 1,120 and 1,259 respectively. The former amounts to Rs. 923-15-10 only in value.

Museum.

14. I take pleasure to report that the nucleus of the proposed Jute Museum has been formed and the members of the Committee had an informal appreciative view of it on the concluding day of the last winter Meeting of the Committee. Since then some progress has been made, but not as much as I expected, again due to the civil commotion in the city, which continued to be prevalent during the most part of the period under review. In spite of the Museum being only in the embryo stage now and consequently not being open to the public, visitors representing various sections of the public have already begun to take interest in it by coming to see it. I have great hopes that given suitable opportunity for expansion, the Museum will attract people interested in jute from far and wide, and the Museum when completed would stand out as an institution of public education and interest.

Acknowledgement.

15. To the Indian Jute Mills Association, the Press, inland and overseas, including the news agencies, particularly the *Associated Press of India* and the *United Press*, All-India Radio, and the different sections of the Committee, thanks are due for their ungrudging help and co-operation. To the Staff of the Publicity Section, who being very small in number had to work hard throughout the year, I take this opportunity of recording my appreciation.

K. I. A. QUADERI,
Publicity Officer.

APPENDIX VI

List of Members of the Indian Central Jute Committee On the 1st April, 1947.

Ex-officio President	Sardar Bahadur Sir Datar Singh, Vice-Chairman, Indian Council of Agricultural Research, New Delhi/Simla.
Four persons nominated by the Governor-General in Council.	1. Sir A. H. Ghuznavi, M.L.A., 19, Strand Road, Calcutta. 2. Mr. Lakshmipat Singhania, Kamla Tower, Cawnpore. 3. Prof. M. N. Saha, F.R.S., Palit Professor of Physics, Calcutta University. 4. Mr. K. K. Chetteur, M.A., Joint Secretary to the Government of India, Ministry of Commerce, New Delhi.
A representative of the Agricultural Department of Bengal nominated by that Government.	Director of Agriculture, Bengal, Calcutta.
A representative of the Agricultural Department of Bihar nominated by that Government.	Director of Agriculture, Bihar, Patna.
A representative of the Co-operative movement in Bengal nominated by the Government of Bengal.	Registrar of Co-operative Societies, Bengal, Calcutta.

Nine persons representing trade interests, *viz* :—	
Two members elected by the Indian Jute Mills Association	1. Mr. I. G. Kennedy, C.B.E., C/o Messrs. Jardine Skinner & Co., 4, Clive Row, Calcutta. 2. Mr. D. I. Duff, C/o Messrs. Barry & Co., 2, Fairlie Place, Calcutta.
One member elected by the Bengal Chamber of Commerce	Mr. A. H. Syme, C/o Messrs. A. M. Mair & Co., 6, Royal Exchange Place, Calcutta.
One member elected by the Bengal National Chamber of Commerce	Mr. D. P. Goenka, C/o Messrs. Ramdutt Ramkissen Dass, 4, Clive Ghat Street, Calcutta
One member elected by the Indian Chamber of Commerce	Mr. K. D. Jalan, C/o Messrs. Sooraj Mull Nagar Mull, 8, Dalhausi Sq , Calcutta.
One member elected by the Muslim Chamber of Commerce	Mr. M. A. H. Ispahani, C/o Messrs. M. M. Ispahani, Ltd., 51, Ezra Street, Calcutta.
One representative of the Shipping and Baled Jute interests nominated by the Calcutta Baled Jute Association	Mr. G. Euthymopulo, C/o Messrs. Rali Brothers, 16, Hare Street, Calcutta.
One representative of the jute trade nominated by the Government of Bihar	Mr. Mohan Lal Jeloka, Katihar. Dt. Purnea.

One representative nominated by the Government of Assam	Maulvi Saiyid Abdur Rouf, B.L., M.L.A., Barpeta, Assam.
Eight persons representing Agricultural interests, *viz*:—	
Six representatives nominated by the Government of Bengal, of whom one would be a land-owner and not more than one may be a Government official	1. Khan Bahadur Abdulla-Al-Mahmood, M.A.,B.L., Chairman, Serajganj Municipality, Serajganj. 2. Mr. Khairat Hossain, M.L.A., Vill. Berakuti, P. O. Saidpur, Dist. Rangpur. 3. Mr. Abdul Hakim Vikrampuri, M.L.A., Munshiganj, Dacca. 4. Mr. Surendra Nath Biswas, M L.A., P. O. Madaripur, Faridpur. 5. Mr. R. L. Biswas, Vill. Narayanpur, P. O. Khalkula, Dist. Jessore. 6. Raisahib J. C. Mondal, Vill. Batabaria, P. O. Mahichail, Dist. Tipperah.
One representative of jute-growers nominated by the Government of Assam who may be an official	Mr. R. C. Woodford, I.D.D., Director of Agriculture, Assam, Shillong.
One jute-grower to be nominated by the Government of Bihar	Rai Bahadur Raghubans Prasad Singh of Kursela, P. O. Ajodhyagunge Bazar, Dist. Purnea.
One member nominated by the Government of Orissa to represent the interests of Orissa.	Director of Agriculture, Orissa, Cuttack.

APPENDIX VII

List of Members of the Standing Sub-Committees of the Indian Central Jute Committee on the 1st April, 1946.

Local Sub-Committee.

1. Mr. I. G. Kennedy, C.B.E., *Chairman.*
2. Sir A. H. Ghuznavi.
3. Mr. K. D. Jalan.
4. Mr. M. A. H. Ispahani.
5. Mr. R. L. Biswas.
6. Mr. A. H. Syme.
7. Mr. D. I. Duff.
8. Mr. S. N. Biswas.
9. President Ex-officio.

Agricultural Research Sub-Committee.

1. President.
2. Director of Agriculture, Bihar.
3. Director of Agriculture, Bengal.
4. Mr. A. H. Syme.
5. Khan Bahadur Abdulla-Al-Mahmood.
6. Mr. R. L. Biswas.
7. Rai Bahadur Raghubans Prosad Singh.
8. Director of Agriculture, Assam.
9. Director of Agriculture, Orissa.
10. Rai Sahib Jagat Ch. Mondal.

Co-opted Members.

11 Prof. S. P. Agharkar, D.Sc.

12. Prof. S. N. Bose, M.Sc., F.N.I.

13. Dr. J. N. Mukherjea, C.B.E., Director, Indian Agricultural Research Institute, New Delhi.

14. Dr. J. S. Patel, M.Sc., Ph.D. Principal, Bihar Agricultural College.

Technological Research Sub-Committee.

1. President.
2. Prof. M. N. Saha, F.R.S.
3. Mr. I. G. Kennedy, C.B.E.
4. Mr. Lakshmipat Singhania.
5. Mr. M. A. H. Ispahani.
6. Mr. D. P. Goenka.
7. Mr. K. D. Jalan.
8. Mr. D. I. Duff.
9. Mr. A. H. Syme.

Co-opted Members.

10. Mr. S. E. Kumana, Inspectorate of General Stores, Cawnpore.
11. Dr. W. G. Macmillan, Ph.D., Chief Chemist, Indian Jute Mills Association Research Institute.
12. Prof. B. C. Guha, D. Sc., Head of the Department of Applied Chemistry, Calcutta University.
13. Prof. J. K. Chowdhury, F.N.I., Head of the Department of Chemistry, Dacca University.

Marketing Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E.
3. Sir A. H. Ghuznavi.
4. Registrar, Co-operative Societies, Bengal.
5. Khan Bahadur Abdulla-Al-Mahmood.
6. Director of Agriculture, Bihar.
7. Director of Agriculture, Bengal.
8. Mr. Mohan Lal Jeloka.
9. Mr. S. A. Rouf.
10. Director of Agriculture, Assam.
11. Director of Agriculture, Orissa.
12. Rai Sahib J. C. Mondal.
13. Mr. D. I. Duff.

Co-opted Members.

14. Director of Agricultural Marketing, Bengal.
15. Mr. D. K. Sannyal, O.B.E., Secretary, Appointments & Information Board, Calcutta University.

Economic Research & Publicity Sub-Committee.

1. President.
2. I. G. Kennedy, C.B.E.
3. Mr. S. N. Biswas.
4. Mr. Lakshmipat Singhania.
5. Mr. R. L. Biswas.
6. Mr. M. A. H. Ispahani.
7. Mr. A. H. Syme.
8. Mr. K. D. Jalan.
9. Director of Agriculture, Bengal
10. Director of Agriculture, Bihar
11. Director of Agriculture, Assam
12. Director of Agriculture, Orissa
13. Mr. D. I. Duff.

Co-opted Members.

14. Prof. P. C. Mahalanobis, I.E.S., O.B.E., F.R.S., Professor of Physics, Presidency College, Calcutta.

15. Prof. H. L. Dey, D. Sc., Head of the Deptt. of Economics, Dacca University.

16. Prof. J. C. Sinha, Ph.D., Head of the Deptt. of Political Philosophy and Political Economics, Presidency College, Calcutta.

17. Prof. J. P. Niyogi, Ph.D., Head of the Deptt. of Economics, Calcutta University.

18. Mr. D. K. Sannyal, O.B.E., Secretary, Appointments and Information Board, Calcutta University.

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Appointments Sub-Committees.

I. AGRICULTURAL RESEARCH.

1. Sardar Bahadur Sir Datar Singh, *President.*
2. Dr. J. N. Mukherjea, C.B.E.
3. Professor S. P. Agharkar, D.SC.

II. TECHNOLOGICAL RESEARCH.

1. Sardar Bahadur Sir Datar Singh, *President.*
2. Mr. K. D. Jalan.
3. Mr. M. A. H. Ispahani.
4. Mr. D. P. Goenka.
5. Dr. J. N. Mukherjea, C.B.E.
6. Sir A. H. Ghuznavi.

III. ECONOMIC RESEARCH.

1. Sardar Bahadur Sir Datar Singh, *President.*
2. Mr. I. G. Kennedy, C.B.E.
3. Mr. M. A. H. Ispahani.
4. Professor M. N. Saha, F.R.S.
5. Sir A. H. Ghuznavi.

सत्यमेव जयते

IV. MARKETING SECTION.

1. Sardar Bahadur Sir Datar Singh.
2. Sir A. H. Ghuznavi.
3. Mr. A. H. Syme.
4. Agricultural Marketing Adviser to the Government of India.

STANDING PUBLICATION COMMITTEES.

(i) Technological Research Laboratories.

1. Vice-President.
2. Professor M. N. Saha, F.R.S.
3. Mr. S. E. Kumana.

(ii) Agricultural Research Laboratories.

1. Vice-President.
2. The Agricultural Commissioner with the Government of India.
3. Director of Agriculture, Bengal.
4. Director of Agriculture, Bihar.

(iii) Marketing Section.

1. Vice-President.
2. Mr. D. I. Duff.
3. Mr. M. A. H. Ispahani.
4. Mr. A. H. Syme.

(iv) Economic Research Section.

1. Vice-President.
2. Sir A. H. Ghuznavi.
3. Mr. G. Euthymopulo.
4. Mr. D. I. Duff.

सत्यमेव जयते

APPENDIX VIII

List of Scientific and other Officers of the Indian Central Jute Committee as on the 1st April, 1947.

Administration.

1.	Secretary	... Mr. G. C. Sen, M.A.
2.	Superintendent	... Mr. K. B. Ray, B.Sc.
3.	First Assistant	... Mr. R. C. Biswas, B.Sc.
4.	Accountant	... Mr. S. K. Acharyya, B.Sc., B.L.

Marketing Section.

5.	Marketing Officer	... Mr. S. M. Gupta, B.Ag. (offg.)
6.	Assistant Marketing Officer	... Vacant

Economic Research Section.

7.	Director	... Mr. D. Ghosh, M.A. (Cantab), Bar-at-law.
8.	Statistical Officer	... ,, K. C. Basak, B.A. (Cantab).
9.	Statistical Assistant	... ,, S. M. Ganguli, M.A.
10.	Librarian	... ,, D. C. Sarkar, M.A.

Publicity Section.

11.	Publicity Officer	... Mr. K. I. A. Quaderi.

Agricultural Research Laboratories.

12.	Director	... Dr. B. C. Kundu, M.A., Ph.D., F.N.I.
13.	Botanist	... Mr. R. L. M. Ghose, M.Sc.
14.	Asstt. Botanist	... ,, K. Ramesh Rao, B Sc. (Hons.).
15.	Assistant Chemist	... Dr. A. C. Bose, Ph.D., A.I.C.
16.	Assistant Entomologist	Dr. G. M. Das, M.Sc. Ph.D., D.I.C.
17.	Assistant Mycologist	... Mr. T. Ghose, B.Sc. (Tempy.)
18.	Scientific Assistant	... ,, A. T. Sanyal, B.Sc., (Ag.) Assoc. I.A.R.I.
19.	Scientific Assistant	... ,, B. B. Das Gupta, M.Sc.
20.	Scientific Assistant	... ,, S. J. Ghosh, B.Sc.
21.	Cytological Assistant	... ,, R. N. Dutt, M.Sc.
22.	Mycrobiological Asstt.	... Mr. N. R. Dutt Biswas, M.Sc.

Agricultural Research Laboratories—contd.

23.	Entomological Assistant	Mr. T. D. Mukherjee, M.Sc.
24.	Head Clerk and Accountant	... Mr. R. C. Chakraborty, B.A.

Technological Research Laboratories.

25.	Director	... Mr. C. R. Nodder, M.A. (Cantab).
26.	Manager, Experiemental Spinning Mills	... Mr. A. S. Gillies.
27.	Senior Research Physicist	... Dr. K. R. Sen, D.Sc. (Dacca)
28.	Senior Research Chemist	Dr. P. B. Sarkar, D.Sc. (Dacca)
29.	Junior Research Assist. (Physicist)	... Mr. B. K. Chakrabarty, M.Sc.
30.	Junior Research Assist. (Chemist)	... Mr. H. Chatterjee, M.Sc.
31.	Head Tester	... Mr. S. B. Bandopadhyay. M.Sc.
32.	Librarian	... Mr. A. Krishnan, B.Sc.
33.	Head Clerk	... Mr. T. C. Chakravarty.

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APPENDIX

INDIAN CENTRAL

Statement of Receipts and Expenditure

RECEIPTS.	Rs.	As.	P.	Rs.	As.	P.
OPENING BALANCE—						
Cash in Hand ...	102	15	6			
With Imperial Bank of India—						
Current Account ...	1,74,661	5	11			
Cash at Sub-offices ...	580	0	0			
Investment in 3% Government Loan 1963-65	24,671	0	0			
				2,00,015	5	5
(A) MONEY RECEIVED UNDER RESOLUTION—						
No. F. 254/34-A of the Govt. of India, late Deptt. of Education, Health & Lands, dated Simla, the 28th May, 1936 ...	...			7,30,000	0	0
(B) OTHER MONEYS RECEIVED BY THE SOCIETY—						
(i) Contribution by the Govt. of Bengal for engagement of Extra Labourers in the J.A.R.L.	362	10	0			
(ii) Proceeds realised by sale of I. C. J. C. Publications ...	1,994	15	10			
(iii) Proceeds realised by sale of advertisement space in the Committee's Bulletin ...	1,412	8	0			
(iv) Refund of Contributions to the Employees' Provident Fund	371	6	0			
(v) Miscellaneous ...	6,521	1	0			
				10,662	8	10
(C) INTEREST ON INVESTMENTS	...			857	6	0
(D) REFUND OF ADVANCE—						
By the Belakoba Co-operative Multipurpose (Jute Sales) Society Ltd.	...			1,440	0	0
Carried over ...	...			9,42,975	4	3

IX.

JUTE COMMITTEE.

for the year ended 31st March, 1947.

EXPENDITURE.	Rs.	As.	P.	Rs.	As.	P.
ADMINISTRATION OF THE SOCIETY :						
Pay of Officers	9,783	5	0			
Pay of Establishment ...	15,738	5	0			
Allowances	16,064	5	0			
Medical Aid to the Servants of the Committee	2,877	5	3			
Contingencies	18,275	11	3			
Grants-in-aid, Contributions etc.	1,271	15	0			
Interim Emergency Allowance ...	1,915	15	9			
				65,926	14	3
MEASURES TAKEN IN CONNECTION WITH THE WORK ON THE IMPROVEMENT OF THE AGRICULTURE OF JUTE.						
I. JUTE AGRICULTURAL RESEARCH LABORATORY.						
Pay of Officers	29,636	3	0			
Pay of Establishment ...	17,655	9	0			
Allowances	20,835	7	0			
Supplies and Services ...	2,756	15	0			
Contingencies	4,800	7	1			
Grants-in-aid, Contributions etc.	2,238	6	0			
Interim Emergency Allowance ...	2,838	13	0			
University Research Schemes ...	16,548	0	0			
Jute Pest Control Scheme, Narsingdi	1,740	4	0			
Subvention Farms in Bengal, Bihar, Assam and Orissa ...	7,292	14	0			
				1,06,337	14	1
II. JUTE RESEARCH REORGANISATION SCHEME (Recurring) ...	...			14,514	14	0
III. JUTE RESEARCH SUB-STATIONS—						
Kishoreganj ...	10,807	7	6			
Narayanganj ...	4,282	13	0			
Konda ...	4,114	15	9			
				19,205	4	3
Carried over ...	...			2,05,984	14	7

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Expenditure

RECEIPTS—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward ...	...	9,42,975 4 3
Carried over ...	...	9,42,975 4 3

IX.

JUTE COMMITTEE.

for the year ended 31st March, 1947.

EXPENDITURE—*Contd.*	Rs.	As.	P.	Rs.	As.	P.
Brought forward ...	...			2,05,984	14	7
MEASURES TAKEN IN CONNECTION WITH THE IMPROVEMENT IN THE TECHNOLOGY OF JUTE—						
RECURRING						
Pay of Officers ...	50,156	11	0			
Pay of Establishment ...	40,915	11	0			
Allowances ...	37,431	3	3			
Supplies & Services ...	14,461	12	6			
Contingencies ...	9,265	12	3			
Grants-in-aid, Contributions ...	5,820	9	0			
University Schemes ...	18,258	0	0			
Interim Emergency Allowance ...	6,849	8	0			
NON-RECURRING						
Extension of Technologi Laboratories	24,284	3	0			
				2,07,443	6	0
MEASURES TAKEN IN CONNECTION WITH THE IMPROVEMENT IN THE MARKETING OF JUTE—						
Pay of Officers	7,616	6	0			
Pay of Establishment ...	2,117	10	0			
Allowances	3,962	3	0			
Grants-in-aid, contributions etc.	579	6	0			
Distribution of Improved Seeds...	402	4	6			
Jute Grading in Bengal ...	10,447	14	6			
do. Bihar ...	1,164	0	0			
do. Assam ...	3,537	0	0			
Co-operative Marketing of Jute in—						
Bengal	14,949	6	0			
Orissa	2,918	0	0			
				47,694	2	0
Carried over ...	...			4,61,122	6	7

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Expenditure

RECEIPTS—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward ...	...	9,42,975 4 3
Carried over ...	...	9,42,975 4 3

IX.

JUTE COMMITTEE.

for the year ended 31st March, 1947.

EXPENDITURE—*Contd.*	Rs.	As.	P.	Rs.	As.	P.
Brought forward ...				4,61,122	6	7
Scheme for collection of jute prices in Mofussil Centres ..	1,841	8	9			
Co-operative Jute Spinning & Weaving Societies in Bengal	3,767	13	0			
Interim Emergency Allowance ...	1,448	4	3			
Contingencies	609	2	0			
				7,666	12	0
MISCELLANEOUS						
I. ECONOMIC RESEARCH SECTION.						
Pay of Officers	18,060	6	0			
Pay of Establishment ...	9,224	2	0			
Allowances	8,774	10	0			
Grants-in-aid, Contributions etc.	1,682	1	0			
Scheme for Economics of Jute Growing & Dr. J. C. Sen Gupta & Marketing Schemes	1,425	12	0			
	11,414	15	6			
Interim Emergency Allowance ...	1,525	3	6			
Contingencies	5,564	2	9			
				56,245	8	9
II. PUBLICITY SECTION.						
Pay of Officers	6,051	0	0			
Pay of Establishment ...	2,834	0	0			
Allowances	3,864	2	0			
Contingencies	5,647	10	6			
Grants-in-aid, Contributions etc.	574	11	0			
Interim Emergencies Allowance	695	8	6			
Museum	3,455	13	0			
				23,122	13	0
III. SCHEME FOR THE EMPLOYMENT OF SPECIAL AGRICULTURAL STAFF IN JUTE GROWING AREAS—						
Bengal	90,150	12	3			
Bihar	23,024	0	0			
Assam	10,226	0	0			
Orissa	5,669	0	0			
				1,29,069	12	3
Carried over ...	...			6,77,227	4	7

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Expenditure

RECEIPTS—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward	...	9,42,975 4 3
TOTAL Rs. ...	...	9,42,975 4 3

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AUDITORS' REPORT:

We beg to report that we have audited the Statement of Receipts and Expenditure of the Indian Central Jute Committee for the year ended 31st March, 1947, and above set forth, with the accounts and vouchers, and have obtained all the information and explanations we have required. In our opinion such statement correctly sets forth the transactions of the Committee for the year.

CALCUTTA,
4th August, 1947.

LOVELOCK & LEWES,
Chartered Accountants,
Registered Accountants.

IX.

JUTE COMMITTEE.

for the year ended 31st March, 1947.

EXPENDITURE—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward ...	...	6,77,227 4 7
BALANCE ON THE 31st MARCH, 1947		
CASH—		
In Hand	4 11 9	
With Imperial Bank of India : Current Account ...	2,40,492 3 11	
At Sub-Offices ...	580 0 0	
INVESTMENT IN—		
3% Govt. Loan 1963/65 ...	24,671 0 0	2,65,747 15 8
TOTAL Rs. ...	...	9,42,975 4 3

G. C. SEN,

Secretary,

Indian Central Jute Committee.


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APPE

Summary of Receipts and Expenditure of the Indian Central Jute Com

RECEIPTS.

Sources of receipt. 1	1936-37 2	1937-38 3	1938-39 4	1939-40 5	1940-41 6	1941-42 7	1942-43 8	1943-44 9	1944-45 10	1945-46 11	1946-47. 12	Total. 13
(1) Opening balance ...	...	4,626	2,02,424	27,814	51,649	63,437	2,04,731	73,321	2,15,730	1,79,168	2,00,015	12,22,915
(2) Grant-in-aid received from the Government of India ...	20,000	5,00,000	4,25,000	4,25,000	4,18,500	4,56,300	3,52,420	4,90,000	5,00,000	5,80,800	7,30,000	48,98,020
(3) Contributions received from the Provincial Governments towards the cost of the schemes undertaken by the Committee ...	...	...	32,500	35,000	62,500	79,257	3,500	4,745	11,087	8,014	363	2,36,966
(4) Other moneys received by the Committee ...	...	113	580	1,472	2,321	5,814	31,593	6,222	10,211	6,153	11,740	76,219
(5) Interest received from investment of the funds of the Committee ...	...	1,125	1,025	2,740	2,116	2,193	1,715	901	955	951	857	14,578
(6) Transfer from the permanent advance account opened for supply of jute seeds of improved varieties ...	...	...	...	49,688	...	...	49,342	...	...	...	...	99,030
Total ...	20,000	5,05,864	6,61,529	5,41,714	37,086	6,07,001	6,43,301	5,75,189	7,37,983	7,75,086	9,42,975	65,47,728

NDIX X

mittee from its inception in 1936-37 to 1946-47.

EXPENDITURE.

Details of expenditure. 1	1936-37 2	1937-38 3	1938-39 4	1939-40 5	1940-41 6	1941-42 7	1942-43 8	1943-44 9	1944-45 10	1945-46. 11	1946-47. 12	Total. 13
(1) Administration of the Committee	15,374	68,988	67,778	69,359	67,789	70,018	56,969	53,066	52,287	60,426	65,927	6,47,981
(2) Measures taken in connection with work on the improvement of the Agriculture of jute	...	24,686	35,499	44,724	49,329	55,253	82,083	97,511	91,556	1,18,801	1,40,058	7,39,500
(3) Measures taken in connection with improvement in the Technology of jute ...	...	1,61,782	2,98,791	1,20,543	1,09,876	1,03,111	1,97,922	1,54,849	1,52,490	1,63,902	2,07,443	16,70,709
(4) Measures taken in connection with improvement in the Marketing of jute ...	...	16,744	54,449	44,471	43,364	22,463	44,725	27,501	25,936	41,964	55,361	3,76,978
(5) Scheme for the improvement of jute Forecast ...	...	13,984	69,964	89,359	1,17,867	1,30,612	22,039	...	6,000	...	...	4,49,825
(6) Scheme for Economic Research and Publicity on Jute	...	2,135	4,490	8,144	19,505	20,785	21,994	26,246	46,079	65,961	79,368	2,94,707
(7) Scheme for the employment of Special Agricultural Staff in Bengal, Bihar, Assam and Orissa	...	15,121	52,944	64,103	65,909	...	1,43,513	286	1,83,248	1,21,606	1,29,070	7,75,800
(8) Permanent advance account for supply of jute seeds of improved varieties ...	...	...	49,688	49,342	...	...	...	...	...	...	...	99,030
(9) Miscellaneous ...	...	...	112	20	10	28	735	...	1,219	2,411	...	4,535
(10) Closing balance ...	4,626	2,02,424	27,814	51,649	63,437	2,04,731	73,321	2,15,730	1,79,168	2,00,015	2,65,748	14,88,663
Total ...	20,000	5,05,864	6,61,529	5,41,714	5,37,086	6,07,001	6,43,301	5,75,189	7,37,983	7,75,086	9,42,975	65,47,728

APPENDIX XI

Abstract Revised budget estimates of the Indian Central Jute Committee for the year 1946-47 and budget estimates for the year 1947-48

SCHEMES.	Revised estimates for 1946-47.	Budget estimates for 1947-48.
	Rs.	Rs.
1. Administration	66,100	67,500
2. An Enquiry into the Marketing and Transport of Jute and its products.	79,300	81,600
3. A Scheme of Agricultural Research on Jute in conjunction with the Department of Agriculture, Bengal		
(1) Jute Agricultural Research Laboratory	1,23,500	1,13,000
(2) Jute Agricultural Research Sub-stations	20,700	20,100
(3) A Scheme for Re-organisation of the Jute Agricultural Research Laboratory ...	1,51,300	5,08,000
4. A Scheme for setting up of an Institute for research on the Technology of Jute		
(I) Technological Research Laboratories	1,80,900	1,87,900
(II) Proposed New Scheme for extension of the work of the Technological Research Laboratories	72,200	13,500
5. A Scheme for the collection and distribution of Statistics and Information on Jute		
(*a*) Economic Research Section	63,300	78,400
(*b*) Publicity Section ...	28,900	26,800
6. A Scheme for the Employment of Special Agricultural Staff in the Jute areas	1,37,200	1,46,300
7. Measure taken in connection with the production and distribution of jute seeds of the improved varieties	.....	50,000
Total ...	9,23,400	12,93,100
Add closing balance ...	20,000	20,000
	9,43,400	13,13,100


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30, Shibnarain Das Lane,
CALCUTTA.





ANNUAL REPORT

OF THE

INDIAN CENTRAL JUTE COMMITTEE

सत्यमेव जयते

FOR THE YEAR
1947-48

CALCUTTA

ANNUAL REPORT OF
THE INDIAN CENTRAL JUTE COMMITTEE
FOR THE YEAR 1947-48.

CHAPTER I.

CONSTITUTION.

The Indian Central Jute Committee was originally set up by the Government of India in their late Department of E. H. & L. in their Resolution No. F. 254/34/A dated the 28th May, 1936 to deal with research on all aspects of jute from the field to the factory. Consequent on the partition of India into two Dominions—Indian and Pakistan, the Government of India decided that this Committee should continue to function as heretofore within the Indian Union under the Administrative control of the Government of India and directed that (*i*) necessary changes should be made in the Constitution and Rules and Regulations of the Committee ; (*ii*) future programme of work of the Committee in India should be chalked out, and that (*iii*) steps should be taken to wind up the affairs of the Committee in the Pakistan Dominion.

The Governing Body of the Indian Central Jute Committee at its special meeting held on the 10th December, 1947 considered these important questions in the light of the orders of the Government of India and the legal advice obtained and made the following amendment to the existing Rules and Regulations of the Committee :—

"The following to be added to the preamble of the Rules and Regulations of the Indian Central Jute Committee below the defination of the word, The Secretary.

"From and after the 15th August, 1947 except in so far as the Society may by Rules otherwise provide, "India" shall mean the Dominion of India, 'Bengal' shall mean 'West Bengal' and references to the 'Government of India' and 'Government of Bengal' shall be construed as references to the respective Governments of the 'Dominion of India' and 'West Bengal'."

The Committee also made necessary changes in its membership as laid down in Rule I of its Rules and Regulations keeping in view the original principle of equality of representation between growers and manufacturers. The new constitution of the Committee provides for three representatives of Agricultural interests to be nominated by the Government of West Bengal as against six of the then Govern-

ment of Bengal, gives one additional representative each to the provinces of Assam and Bihar to be nominated by the respective Provincial Governments and includes one new representative to be nominated by the Government of United Provinces to represent the interests of that province. The representation of the Muslim Chamber of Commerce on the Indian Central Jute Committee was withdrawn and the seat so vacated was alloted to the Indian Chamber of Commerce, who was thus given two representatives instead of one in the past. A list of the members of the Committee showing the Constituencies they represent according to the revised Constitution will be found in Appendix VI.

In accordance with the decision of the Committee, the six representatives nominated by the then Government of Bengal and also the representative nominated by the Muslim Chamber of Commerce ceased to be members of the Committee with effect from the 10th December, 1947. The thanks of the Committee are due to these members, *viz.*, Messrs. S. N. Biswas, Khairat Hossain, A. H. Vikrampuri, R. L. Biswas, G. R. Gaffer, Abdullah-Al-Mahmood and Rai Sahib J. C. Mondal, for the valuable services rendered by them during the period they served the Committee. The Committee's thanks are also due to Mr. A. H. Syme, the representative of Bengal Chamber of Commerce on the Committee, who resigned his membership during the year under report. He has been replaced by Mr. J. N. Smart, who has been nominated by the Bengal Chamber of Commerce to serve in his place.

Sardar Bahadur Sir Datar Singh, Vice-Chairman, Indian Council of Agricultural Research and Additional Secretary to the Government of India, Ministry of Agriculture and Mr. I. G. Kennedy, C.B.E., continued to be the President and the Vice-President of the Committee during the year under report.

MEETINGS.

Main Committee.

Due to the changes in the constitutional position of the country, the Annual General Meeting and the meeting of the Governing Body of the Committee, which were scheduled to be held in July, 1947, could not be held at that time and they had to be postponed till December.

The Governing Body met on the 10th December, 1947 to consider the changes that were necessary to be made in the constitution of the Committee in the new set up of the country after the partition of India. After careful consideration of the various issues, involved in the light of the advice tendered by the legal experts and also directions received from the Government of India, the Committee made necessary changes in its constitution and these have been mentioned above.

The Committee viewed with great concern the position of jute industry in India which had arisen as a result of the division of the country, and discussed in great details ways and means for increasing the production of raw jute in the Indian Union to meet the requirements of Indian Jute Mills, which was one of the major industries of India. The Committee realised the importance of the problem and unanimously agreed that all possible efforts should be made to grow more jute in the Indian Union in order that India may be self-sufficient in the matter of supply of raw jute to feed her Jute Mills.

In order to increase the production of jute in the Indian Union immediately, the Committee made, amongst others, the following specific recommendations to the Provincial Governments of West Bengal, Bihar, Assam and Orissa :—

(1) Utmost efforts should be made to procure all available jute seeds ;

(2) Aman lands should be utilised for sowing the early varieties of jute ; and

(3) Uncultivated lands, where jute could be grown should immediately be brought under cultivation by supplying seeds and manures to the cultivators at concessional rates.

The Provincial Governments were assured of all help and facilities from the Committee that might be required by them to implement these recommendations.

The necessity for growing improved seeds by the Provincial Governments in their departmental farms and for encouraging the growers to do the same by inducement, if necessary, in order that ample supplies of seeds may be available for increased production, was also stressed by the Committee.

The members again met on the 13th December, 1947 to consider in details the future programme of work of the Committee in the Indian Union and made various recommendations of far reaching importance to tackle the complicated problem of immediate increased production of jute in the Indian Union and to organise jute research in India on a well planned basis. The main recommendations are summarised below :—

Agricultural Research.

(*a*) A Central Agricultural Jute Research Station should be established in the Indian Union on the basis of the Re-organisation Scheme of Jute Agricultural Research, which was previously drawn up and approved by the Government of India.

With the winding up of the Committee's Jute Agricultural Research Laboratory at Dacca in Pakistan, it was considered essential to set up immediately another Jute Research Institute in the Indian Union to continue the important agricultural researches that were being carried out at Dacca and the Committee noted with thanks, the offer made by the Government of West Bengal to spare 50 acres of land at the Chinsurah Government Farm to enable the Committee to start the nucleus of a Jute Research Laboratory there immediately.

(*b*) Immediate survey of land in the jute-growing provinces of West Bengal, Bihar, Assam and Orissa should be undertaken to find out the suitability of particular types of land for growing particular varieties of jute so as to assess the extent to which jute cultivation might be increased in the Indian Union. The Committee's expert Agricultural Officers and staff were directed to assist the Provincial Departments of Agriculture in conducting the desired survey.

(*c*) The Committee's important Schemes of Jute Subvention Farms to test the new strains of jute under cultivators' conditions and Jute Pest Control Scheme to find out effective measures of jute pest control, which were being conducted in the East Bengal, should be continued in the Indian Dominion.

(*d*) Rs. 1,50,000 should be provided by the Committee for payment as advance without interest to Provincial Governments, repayable in five years, for assisting in the establishment of seed

multiplication farms in the different jute growing provinces in the Indian Dominion on the basis of Rs. 10,000 for every hundred acres of land to be selected by the Provincial Governments in consultation with the Director, Jute Agricultural Research.

It was further decided that selected jute-growers should be registered for growing improved seeds under the supervision of the Provincial Departments of Agriculture.

(*e*) One Jute Research Outstation should be established in each of the four provinces to conduct agricultural researches on jute under different soil and climatic conditions. This was in accordance with the Jute Agricultural Research Re-organisation Scheme, which was approved by the Government of India.

(*f*) The scheme for the Employment of Special Agricultural staff in the jute-growing provinces, which was disbanded from September, 1947, should be revived forthwith for undertaking intensive propaganda in aid of an all-out drive for increased production of jute.

Technological Research.

(*i*) In the new set up of the country the Committee realised the urgent need for intensive and well-planned research on the technology of jute and decided that the technological research re-organisation scheme, which was framed by the Indian Central Jute Committee two years ago with this object in view, should now be implemented and the Government of India requested to approve of the scheme to enable the Committee to implement it gradually.

(*ii*) A special Sub-Committee, with the following personnel, was set up to go into the question of priority to be given in taking up the various research items laid down in the programme of work of the Technological Research Re-organisation Scheme and to submit a report to the Committee in the matter :—

(1) Prof. M. N. Saha, F.R.S.
(2) Dr. J. K. Chowdhury, Ph.D., F.N.I.
(3) Dr. P. K. Parija, D.Sc.
(4) Dr. W. G. Macmillan, Ph.D.
(5) Mr. C. R. Nodder, M.A. (Cantab.), O.B.E.
(6) Mr. I. G. Kennedy, C.B.E.
(7) Mr. K. D. Jalan.

(*iii*) On the question of the re-organisation of the existing Technological Research Laboratories into a full-fledged institute for studying all technological problems relating to jute industry, the Government of India suggested for the consideration of the Committee that it should try to persuade the Jute Industry to make substantial donations for the establishment of the research Institute as the Cotton Industry had done for the promotion of research in cotton technology. The Committee expressed the view that it would be hardly fair to ask the Jute Industry to contribute towards the establishment of a Research Institute by Government in view of the fact that the Industry had already spent a lot of money for a Research Institute of its own and was contemplating to spend a further sum of about Rs. 20 lakhs in the near future.

Marketing.

A separate section existed for marketing research on jute. In view of the fact that work in this section was greatly reduced owing to the abolition of the two cottage industry Co-operative Societies, which were functioning in the East Bengal, and also in view of the fact that the work of this branch was closely related to the economic aspects of the jute industry, it was decided that this section should not have a separate existence but should be amalgamated with the Economic Research Section under the Director of Economic Research. It was further decided that the programme of work, which was laid down in the Re-organisation Scheme of the Marketing Section, should be undertaken by the existing staff of the Marketing Section under the Director of Economic Research.

Economic Research.

The Committee stressed the urgency of implementing the Economic Research Re-organisation Scheme, which was previously drawn up by and was pending with the Government of India for approval. That Scheme was aimed at carrying out comprehensive researches into all economic aspects of jute trade, which was essential both for the agriculturists and the trade.

The Committee further decided that the scheme of investigation into the economics of jute-growing, which was undertaken by the Committee two years ago to find out a suitable technique for estimating the cost of production of jute and was being carried out at five

centres in East Bengal, should be continued in five new centres to be established in the Indian Dominion—two in West Bengal, one in Bihar, one in Assam and one in Orissa.

Publicity.

For the appreciation of the results of researches of the Committee by the growers and for intensive propaganda for jute cultivation, it was decided—

(1) that posters with attractive photographs and pictures on the lines adopted by the Indian Central Sugarcane Committee should be prepared and widely distributed throughout the Jute-growing areas in the Indian Union, and

(2) that demonstrations in villages or groups of villages should be undertaken.

Besides the above, the Committee at this meeting considered and adopted the Annual Reports and progress reports of the different Sections under it and also of the various University Research Schemes, which were being conducted under the auspices of the Committee for the year 1946-47. In adopting the Annual Report of the Technological Research Laboratories, the Committee observed that—

(1) the Director, Technological Research Laboratories, should put up a note, in consultation with the industry as to which of the results obtained in the laboratories were being utilised by the Industry and which were not with reason,

(2) the results of research of practical nature should be written in simple language, preferably with some charts and attractive photographs and distributed to the cultivators through the Provincial Governments, and

(3) that the Director, Technological Research Laboratories, should in consultation with the Industry, arrange for periodical discussions with them concerning practical

application of the results of research and for eliciting information about their requirements

SUB-COMMITTEES.

Most of the detailed work of the Committee is carried through the various Standing Sub-Committees. This procedure not only effects a considerable saving of time but also lightens the task of the Committee at its half yearly meetings. The meetings of the different sub-committees that were held during the year under report and the more important recommendations made by them are noted below :—

I. LOCAL SUB-COMMITTEE.

This Sub-Committee deals mainly with the financial and administrative matters and such other urgent matters which cannot be postponed for consideration at the usual half-yearly meetings of the Committee. It held eight meetings during the year. Besides the many routine, administrative and financial matters, which were considered by the Sub-Committee, some of the more important subjects which were dealt with by it were as follows :—

(*i*) The question of production, distribution, multiplication and checking of purity of the improved varieties of jute seeds was discussed by the Sub-Committee and the Committee's Director, Jute Agricultural Research prepared a comprehensive memorandum on this subject. The Sub-Committee noted that investigations for finding out new improved strains of jute seeds were already in progress under the Committee's Jute Agricultural Research Laboratories with encouraging results and agreed with the views of the Director, Jute Agricultural Research, that it was essential that before the final results could be put out to the agriculturists, large scale experiments should be conducted under the cultivators' conditions under the constant guidance and control of the Committee and with this end in view the establishment of Jute Research Outstations was absolutely necessary.

(*ii*) With a view to giving incentive to the authors to contribute good original articles to the Committee's monthly organ 'The Jute Bulletin,' the Sub-Committee decided that a sum of Rs. 1,000/- should

be set aside in the Committee's budget for payment of remuneration to the authors on the merit of their articles.

(*iii*) The serious problems with which the Indian Jute Industry had been confronted as a result of the division of India received the attention of the Sub-Committee and the Sub-Committee viewed with great concern the utter insufficiency of the raw jute in the Indian Dominion necessary to keep its vital industry running. It considered the problem in all its aspects at its four successive meetings in September, October and November, 1947 and after mature deliberations and careful consideration made the following recommendations :—

"The Government of India should take immediate steps to increase the production of raw jute in the Indian Union in order to be self-sufficient in the matter of supplies of raw jute to feed the Indian Jute Mills and to maintain India's position in the world trade in jute and jute goods. For this purpose it is essential that the acreage under jute should immediately be increased in the jute growing provinces in the Indian Union without decreasing the acreage under food crops but by reclaiming and utilising waste and fallow lands. Steps should be taken to increase the yield and improve the quality of the fibre by the application of modern scientific methods of jute cultivation and the use of improved seeds and chemical fertilisers.

There should be provision for growing improved seeds in sufficient quantities to attain the objective of increased production of the fibre and intensive researches in these directions should be continued. The immediate target of production should be at least 65 lakhs of bales, which will include 60 lakhs of bales for domestic consumption in villages. The question of export of raw jute produced in the Indian Union may be left over for the present, to be taken up later as an integral part of the long-term objective of the plan of increased production. As this is a matter of urgent and vital importance to the Indian Union, the Sub-Committee urged that the Government of India should immediately take up this question and arrange to call a conference of the representatives of the Provincial Governments concerned and of the trade and of the Indian Central Jute Committee to devise ways and means by which the objective of producing 65 lakhs of bales of jute in the Indian Union may be achieved in the near future."

The Sub-Committee stressed that the Government of India should allot a very high priority to the question of jute production in the Indian Union and formulate a scheme to bring about the desired results as speedily as possible. In this connection the Sub-Committee made the following further suggestions —

(1) To appoint a Commission, in consultation with the Provincial Governments concerned, to tour the provinces with the object of surveying the position and obtaining first-hand information and to submit a report ;

(2) To issue directives to all Provincial Governments to encourage jute cultivation on waste and fallow lands, wherever possible ;

(3) To co-ordinate the efforts in this direction in different provinces and to lay down a progressive policy on an all India basis ;

(4) With the concurrence of the Provincial Governments concerned to hold periodical meetings of the Provincial Directors of Agriculture to discuss the possibility of increasing jute cultivation and to invite practical suggestions ;

(5) To launch a grow-more-jute campaign and carry on propaganda for increasing national wealth by jute cultivation.

The above recommendations were forwarded to the Government of India.

The Government of India gave very careful consideration to the policy to be followed in future with regard to the cultivation of jute in the Indian Union and enunciated their policies in this respect as follows :—

(*a*) While there should be no regulation of the area under jute, a careful watch should be kept so as to ensure that there is no large scale division of rice lands to jute ;

(*b*) Facilities should be afforded to the cultivators of jute so as to increase the yield per acre of jute to the

maximum extent possible by the use of improved seeds, fertilisers, irrigation and so forth ; and

(*c*) Efforts should be made to bring as much waste land as possible under the cultivation of jute.

With a view to implement the above policies, the Government of India desired that a first class Jute Agricultural Institute should be established in the Indian Union and the Committee's existing Technological Research Institute should be reorganised into a full-fledged Institute for studying all technological problems relating to jute. These questions were considered by the Indian Central Jute Committee at its meeting in December and its recommendations already stated in the preceding paragraphs.

(*iv*) The Sub-Committee considered a note prepared by the Committee's Director of Economic Research on the question of Jute Substitutes and decided that a fuller report on this question should be prepared by the Director in collaboration with the Indian Jute Mills Association giving all details as to how far the substitutes affected or were likely to affect the jute markets abroad.

(*v*) The Sub-Committee considered the question of the revision of the scales of pay of the various posts under the Committee in the light of the revised scales of pay which were adopted by the Government of India in their subordinate and attached offices on the basis of the Central Pay Commission's recommendations and recommended revised scales of pay for the various posts under the Committee.

II. AGRICULTURAL RESEARCH SUB-COMMITTEE TECHNOLOGICAL RESEARCH SUB-COMMITTEE MARKETING SUB-COMMITTEE, ECONOMIC RESEARCH AND PUBLICITY SUB-COMMITTEE.

The above standing Sectional Sub-Committees, as their names imply, are concerned with the matters relating to the work and activities of the Agricultural Research, Technological Research, Marketing, Economic Research and Publicity Sections of the Committee respectively. They scrutinise the progress reports of the

respective Sections, approve of the programmes of work, examine new Schemes and advise the Committee mainly on the Technical details of the various Schemes. During the year under report each of the above sub-committees met once in conjuction with the Main Committee and made various recommendations on the different Schemes, which guided the Committee in arriving at definite decisions on the subjects.

III. APPOINTMENTS SUB-COMMITTEES.

The Economic Research Appointments Sub-Committee met on the 10th December, 1947 to select a suitable candidate for the post of an Assistant Economics Officer in the Economic Research Section of the Committee. None of the candidates interviewed by the Sub-Committee was considered suitable for the post.

The Agricultural Research Appointments Sub-Committee met at New Delhi on the 12th and 13th January, 1948 and selected candidates for a number of important vacant posts under the Committee's Jute Agricultural Research Institute, which was set up at Hooghly in West Bengal.

IV. SPECIAL SUB-COMMITTEE.

(a) Jute Grading Sub-Committee.

This standing Sub-Committee was set up by the Committee to consider the question of grading of jute fibre on a more scientific basis. As reported in the earlier Annual Reports, this Sub-Committee had gone into this complicated question several times in the past to arrive at a satisfactory scheme of grading of jute fibre. The schemes recommended by it have not so far found favour with the trade. This Sub-Committee was reconstituted in January, 1947. The new Jute Grading Sub-Committee met on the 2nd April, 1947, reviewed the whole position and recommended a scheme of grading which it considered to be a definite step towards better grading of jute fibre. The scheme was forwarded to the trade for expression of views. The reaction of the trade is not this time also favourable to the recommended scheme and further modification of the scheme is now under consideration.

(b) Priority Sub-Committee.

As already reported, this special Sub-Committee was set up by the Indian Central Jute Committee at its last meeting held in December, 1947 to consider the question of priorities to be given to the programmes of research work of the Technological Research Laboratories under the Technological Research Re-organisation Scheme and new and extended uses of jute. This Sub-Committee has so far met twice and made important recommendations on the question of the programme of work of the Technological Laboratories and the implementation of the Technological Research Re-organisation Scheme within a specified period. These recommendations will be considered by the Committee at its meeting to be held in July, 1948.

CHAPTER II.

SCIENTIFIC INVESTIGATIONS.

(a) Agricultural Research on Jute.

Dr. B. C. Kundu, M.A., Ph.D., F.L.S., F.N.I., Director, Jute Agricultural Research, held charge of the Agricultural Research Laboratories of the Indian Central Jute Committee at Dacca now being reconstituted at Chinsurah in West Bengal. The work of the laboratories and the farm was undertaken in accordance with the programme of work laid down by the Committee. Serious communal troubles during the season interfered with the normal working of the central station and the substations. The announcement of the partition of India followed by the stand-still orders brought a sudden disruption of the entire organisation.

The Central station and the substations with all improved seeds, records containing important experimental data and all apparatuses and equipment were occupied by force by the Pakistan Government in December, 1947.

The future of the Jute Agricultural Research Laboratories and the establishment of a new Jute Agricultural Research Institute was decided by the Indian Central Jute Committee in December,

1947. During the uncertain period that intervened between the partition of the country and the decision of the Committee a number of experienced members of the staff left the service of the Committee.

SEASON.

At Dacca, land allotted to us was released late in the season, consequently sowings could not be completed earlier than the first week of June. Intercultures could not be given to the crop in proper time due to frequent showers of rain and to paucity of labours caused by high communal tension that prevailed at that time. Some of the trials that were overgrown with weeds had to be rejected. Seeds were collected from the rest.

At the Jute Research substations at Konda, Kishorganj and Narayanganj, sowings and intercultures were completed. One trial at Narayanganj and the bulk of primary and secondary selections at Konda were destroyed by flood water and water hyacinth. Rest of the trials at Narayanganj, all trials at Konda and none out of twelve trials at Kishorganj were harvested and seeds were obtained from as many of them as possible.

COLLECTION OF TYPES.

During a survey tour of the provinces of Assam, West Bengal, Bihar and Orissa 121 types of cultivators' samples of jute seeds were collected of which 95 were *capsularis* and 26 were *olitorius*.

BREEDING OF IMPROVED JUTE.

Fifty-five breeding and varietal trials in all were put at Dacca and at the substations, yield and other data and the seeds obtained from them were left back.

Bulk seeds of improved strains multiplied by the Department of Agriculture, Bengal, for subvention trial could not be brought. Some old material available to us will be multiplied at the Chinsurah farm in the coming season.

The early, high-yielding strains except 321 tested at Belakoba for the third year maintained the higher quality ratio as compared with the locals. They are 84 to 86 as against 74 and 77 of the controls.

More than 2000 selections made in the multiple crossing materials were left back. Work will be continued with some old materials available to us.

Data and seeds obtained from other breeding trials had all to be left back. Of the 94 subvention trials conducted over a wide range of soil and climatic conditions of Bengal, Bihar, Assam and Orissa results of only 12 trials of Bihar and of 4 trials of Assam were available. In Bihar C 39-212 proved to be the best yielding 12.4 per cent more than the locals while in Assam C 42 Nj-412 out yielded the locals by 17.7 per cent.

The scheme of subvention trial in these provinces had to be dropped for 1948-49 as the bulk seeds multiplied for the purpose could not be brought.

INHERITANCE OF CHARACTERS.

Little progress could be made in the study of inheritance of characters during the year under review for reasons already stated. The whole set of genetic strains, built up by year to year isolation of new materials, is now lost to us.

CULTIVATION.

Data are not available from any of the four Line *Vs.* Broad Cast trials carried out at Dacca, Kishorganj, Chinsurah and Rangpur.

Seed rate and harvest stage experiment at Kishorganj had again to be abandoned due to unavoidable circumstances. The experiment will be repeated at Chinsurah in a modified form.

ANATOMICAL AND CYTOLOGICAL INVESTIGATIONS.

Investigations on Chromosome structure and morphology of seven types of jute, comparative embryological study of D. 154 &

C. G. and study of cytology of the V2 mutant were all in progress, but blocks, slides sketch drawings and notes had all to be left back.

QUALITY OF JUTE.

Experiments on retting technique were undertaken in accordance with the programme, but these had to be abandoned. The data, which were incomplete, are not available to us.

BIOCHEMICAL STUDIES.

Elaborate studies on retted jute, retting waters and jute soil were taken up and a good number of bacterial and fungal cultures were maintained in this connection. All the cultures and papers containing important data were left at Dacca. Work on similar lines will be taken up when adequate facilities are available.

DISEASES.

Fifty type cultures of the stem-rot fungus maintained at Dacca were all left back.

Experiments on seed treatment and storage with Agrosam-G and Granosan indicated possibilities of storage of jute seeds after treatment.

Effect of Perenox spray against secondary infection was studied. A. O. 25% solution inhibited germination of mature spores under laboratory conditions.

Manurial trials were conducted at Dacca and at Kishorganj for the third year. The trial at Dacca was damaged by miscreants while the data of the Kishorganj trial was left there. Results indicated in the past in response to N. & K. were obtained.

PESTS.

Rosin-fish-oil soap sprays in the morning followed by lime-sulphur dusting was effective against nymph and adults of the white mite. No data are available.

Life history of Ferrisia virgata CKLL was reinvestigated for a fuller knowledge of certain points. Positive results in controlling this pest were obtained by application of gammexane, D. 025 and D. 034, under laboratory conditions, but no data could be brought.

Experiments on control measures of Jute Buprestid were carried out against eggs, grubs, pupae and adults of the pest. Nicotine sulphate proved most effective against eggs. Both D. 025 and D. 034 of gammexane had some effect on adults. Large-scale breeding of parasite was not possible ; so biological control could not be undertaken. All data were left back at Dacca.

PEST AND DISEASE CONTROL SCHEME.

Cultivators in larger numbers wanted to be included within the scheme but we had to restrict the area to 75 acres of land keeping in view the resources available to us. Demonstrations of control measures were carried out against odds and they proved to be highly satisfactory.

Bordeaux mixture sprayed against leaf infection indicated that it might prove useful at an early stage of secondary leaf infection.

NEW JUTE AGRICULTURAL RESEARCH INSTITUTE.

In accordance with the decision of the Indian Central Jute Committee a new Jute Agricultural Research Institute is being reorganised in the Indian Union with a farm at Chinsurah and with the laboratories in a rented house at Hooghly.

Formal possession of the 52 acres of lands kindly given to us by the Government of West Bengal was taken on 7th March, 1948 and field operation started on 10th March, 1948. Very great difficulties are being experienced in getting apparatus and equipments for the laboratories, but every attempt is being made to have the laboratories fitted by August next.

Vacancies caused by the resignation of a number of members of the staff and new posts created by the re-organisation scheme are being filled in. Suitable persons have been selected who are expected to join shortly.

PUBLICATIONS.

In all 5 papers were published during the year under report.

(b) Technological Research on Jute.

Mr. C. R. Nodder, O.B.E., M.A., was in charge of the Committee's Technological Research Laboratories at Tollygunge. The work done during the year is summarised below. Special attention to the importance of (*a*) fineness and (*b*) the simplest possible mesh-structure for good spinning quality and the need for close attention to these points in breeding and agricultural investigations have been stressed by the Director.

Attention is also called to the facilities in the Technological Laboratories for assisting the trade in various practical problems and steps which have been taken with the object of getting the trade to make greater use of these facilities are referred to.

SPINNING TECHNIQUE.

As the Laboratories are now well-equipped with methods for spinning yarns from small samples of fibre no further work was carried out on such methods, but good use was made of the method described last year for spinning yarn from samples weighing as little as two pounds.

BACKGROUND RESEARCH—PHYSICAL.

A ply-yarn strength tester has been modified for carrying out tests on the tensile strength of twisted bundles of fibre. It is thought that this character may link up even more closely with spinning quality than the ballistic work of rupture of such bundles. The apparatus has worked well in preliminary tests.

Tests have been carried out on the coefficient of friction of two pads of jute fibre, using an inclined plane method. Rather vague indications were obtained that a high coefficient of friction goes with high yarn irregularity. A closer connection may possibly be found when the fibre is treated with batching emulsion before

the tests, and experiments are being carried out. A second method of measuring coefficient of friction has also been devised in which one bundle of fibre is twisted round another and loaded until it slips.

An apparatus for comparing the hardness of single strands of jute fibre has been constructed. The fibre is locally compressed between a presser foot and a support and the increase in diameter measured under the microscope. No relation with spinning quality is so far apparent but an improvement in the apparatus is under consideration.

A study of the breaking extension of jute yarns has been made. For yarns of medium count and normal twist it is of the order of two per cent. Variation in twist factor affords a ready means of controlling extensibility, within limits and subject to considerations imposed by the purpose for which the cloth is intended.

Various methods of measuring yarn diameters have been compared in a series of tests and the thread-winding method described in the full report is considered the most suitable for many purposes.

Interest has been shown by the trade and by machine makers in the method of measuring yarn irregularity devised in the Laboratories and steps have been taken to make the value of the method more widely known.

BACKGROUND RESEARCH—CHEMICAL.

Investigations of the constituents and their mode of association have continued and a number of important papers have been published. The further results support the view that the polyuronic acids which occur among the hemicelluloses are united with lignin by an ester linkage.

TESTS ON J. A. R. L. SAMPLES.

As a result of partition relatively few samples of the 1947 crop were received from Subvention Farms. The results obtained on some further samples of C 39-212, C 41-13 and C 42 Nj-412 and some trials of early varieties have been reported.

TESTS ON COMMERCIAL JUTE SAMPLES.

No 1947 crop samples have so far been received for routine tests but further attempts are being made to get suitable samples. A number of samples from miscellaneous sources were examined and reported on, including a small number from various centres in the Indian Union. All the latter were of good quality, excepting one from N. Bengal which was considered to be over-retted. The samples were too few in number for any general conclusions to be drawn and it is hoped to get a more extensive set.

FIBRE CHARACTERS AND SPINNING QUALITY.

Work on the new series of samples has been continued and it is hoped to complete it during the year. The fineness, ballistic work of rupture and torsional rigidity are characters which prove particularly useful in predicting spinning quality. Suggestions are made for agricultural work designed to produce in the fibre the characters which T. R. L. work indicates as desirable for good spinning quality.

GRADING.

No further progress has been made and the trade still finds itself unable to accept any of the simple, but scientific, schemes put forward. The position is not satisfactory and it is proposed to reopen the discussions. It would be a step in the right direction if the trade would merely agree to reinserting into the description of Bottoms the phrase "not acceptable under or capable of inclusion in a mark above." If that could be followed by the splitting of 'Bottoms' into two marks another step would be achieved and it is difficult to believe that this is impossible.

MOISTURE RELATIONSHIPS.

It is considered that steps should be taken to impose penalties when jute offered for sale has a regain exceeding a specified amount. The limit could be made high enough at first to ensure that there would be no hardships and lowered later as a result of the experience gained by working the scheme.

STORAGE OF SUGAR IN JUTE BAGS.

A fresh set of trials with chemically treated bags is in progress. Results will be available after the 1948 rainy season.

BLENDING EXPERIMENTS.

Further experiments have recently been taken up, using blends of hard and soft jute, and jute and Urena.

SINGLES AND DOUBLING TWISTS.

A new series of tests with 3-ply yarns was made and it is provisionally concluded that the singles twist factor for maximum ply-yarn twist need not exceed about 15, the value used in earlier trials. This applies to yarns of medium counts. Finer yarns theoretically require lower twist factors and coarser yarns higher twist factors for maximum strength but so far only a few experimental data in this connection have been obtained.

JUTE COMPETITORS.

A number of further samples have been examined. Meshiness and coarseness of other bast fibres that are generally similar to jute are factors which tend to the quality. The most promising substitutes are roselle, urena and mesta.

NEW OR EXTENDED USES.

Yarns necessary for a further trial with a jute-cotton union for clothing have been got ready. Commercial samples of such unions have been examined and details of structure and processing for the production of a suitable cloth have been carefully considered.

Data bearing on the economics of the production of fine ply-yarns for knitting have been obtained.

TREATMENTS OF FIBRE AND YARN.

Further investigations, chiefly with new or extended uses for jute as a background, have been made. The study of the action of sodium chlorite has been carried a stage further and a paper has been sent for publication.

Other work included the examination of a possible method of rot-proofing, following up an idea suggested by the results obtained from our investigation of the hemiculluloses of the fibre. The behaviour of yarns on expossure to the weather has also been studied. Experiments on the compressibility and resilience of yarns variously treated with caustic soda solutions have been made.

(c) University Research Schemes.

During the year under report work continued on the six University Research Schemes, which are being carried out under the guidance of the eminent Professors of the University of Calcutta, Bose Research Institute, Calcutta and the Presidency College, Calcutta, with funds from the Committee. The Scheme of impregnation of bleached and delignified Jute Fibre with suitable synthetic resins, which was being carried out in the Dacca University under the guidance of Prof. J. K. Chowdhury, was transferred to the Bose Research Institute during this year as the Professor retired from the Dacca University and joined the Bose Research Institute from July, 1947. The details of the Schemes now working are given below :—

	Name of Scheme.	Name of the Professor in charge of the Scheme.	Year of working of the Scheme.	Amount paid by the I.C.J.C. during 1947-48.
				Rs.
1.	X'Ray analysis of jute fibre.	Prof. M. N. Saha, F.R.S., Palit Professor of Physics, Calcutta University.	6th year	6,717

Name of Scheme.	Name of the Professor in charge of the Scheme.	Year of working of the Scheme.	Amount paid by the I.C.J.C. during 1947-48.
			Rs.
2. Chemical Utilisation of Jute and Jute-waste.	Dr. B. C. Guha, D.Sc., Head of the Department of Applied Chemistry, Calcutta University.	6th year	8,556
3. Bio-Chemical Investigations into the processes involved in the retting of jute.	Do. ..	6th year	4,736
4. Impregnation of Bleached or delignified jute fibre with suitable synthetic resins to improve its qualities.	Dr. J. K. Chowdhury, Ph.D., F.N.I., Head of the Department of Chemistry, Bose Research Institute, Calcutta.	6th year	5,825
5. Research on the Physiology of jute plant.	Professor J. C. Sen Gupta, D.Sc., Professor of Botany, Presidency College, Calcutta.	4th year	5,373
6. Scheme of research on the effect of X'Ray, gamma rays and neutrons on jute seed.	Dr. D. M. Bose, D.Sc., Director, Bose Research Institute, Calcutta.	3rd year	8,411

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The progress of work of all the Schemes mentioned above was satisfactory during the year under report. The results obtained on some of them were particularly encouraging.

CHAPTER III.

ECONOMIC INVESTIGATIONS.

Economic Research.

During the period under review, the Section was under the charge of Mr. D. Ghosh, Director of Economic Research, up to the 29th August 1947. Thereafte· he left the Committee's services to take up an appointment under the United Nations, and Mr. K. C. Basak, Statistical Officer, took over charge of the Section as the Officiating Director of Economic Research in addition to his own duties. Later, in December 1947, the Marketing Section of the Committee was amalgamated with the Economic Research Section in pursuance of a decision of the Committee and placed under the Director of Economic Research.

The Committee at its meeting held in January 1947 approved the following programme of work, of which items (5) and (6) were dropped out according to the Committee's decision made in December, 1947 :—

(1) Investigation into the Economics of Jute Growing.
(2) Study of Mofussil Prices of jute and other statistics.
(3) Study of the Indian Markets for jute goods.
(4) Statistical Analysis of Data on the Physiology of Jute.
(5) Study of secular, cyclical and seasonal variations of important jute statistic .
(6) Study of the British Market for jute and jute goods.

The partition of Bengal gave rise to new problems for the jute industry which were investigated by the Officiating Director at the instance of the Government of India. He prepared a series of notes on these problems which were forwarded to the Government of India. He also attended several conferences called by the Governments of India and West Bengal in this connection.

The progress of work of the Section was quite satisfactory, although the Section had to struggle hard against difficulties created· by the shortage of staff and communal troubles. A brief summary of the work done during the period under review is given below :

INVESTIGATION INTO THE ECONOMICS OF JUTE GROWING.

The work on this scheme in 1947, which was the third year of the investigation, was carried out on an enlarged scale, the number of centres being increased from 3 to 5 and the number of farms at each centre being raised from 20 to 50. Additional staff was provided to cope with the increased volume of work. As all the five centres were located in East Bengal, they had to be closed down at the end of December 1947 in pursuance of a decision of the Government of India. Consequently, the enquiry relating to the jute crop was fairly complete, but these for paddy and winter crop had to be cut short. A report on the investigation in 1947 will be considered by the Committee at its July meeting.

The report for 1946, which was prepared in 1947, gave the details of the investigation in the second year along with the estimates of the cost of production of jute and paddy. The reliability of these estimates was examined statistically and found to be moderately satisfactory. It was, however, suggested to increase the si e of the sample in order to make the estimates more reliable. A tentative method was also proposed in the report for forecasting the cost of production of jute on the basis of data relating to the pre-harvesting operations. The efficacy of the method, however, will have to be tested further before it can be recommended for adoption.

The Committee considered and adopted this report at its meeting held in December, 1947, and decided that the five centres in East Bengal should be abolished and in their place five new centres should be opened in the Indian Dominion in consultation with the Provincial Governments concerned. It was further decided that two of these should be in West Bengal and one each in Bihar, Orissa and Assam. Accordingly, five centres have been opened this year at the following places :—

West Bengal	(1) Belakoba (Jalpaiguri).
	(2) Monoharpur (Hooghly).
Bihar	(3) Purnea.
Orissa	(4) Kendrapara.
Assam	(5) Rupohi (Nowgan).

STUDY OF MOFUSSIL PRICES OF JUTE AND OTHER STATISTICS.

This enquiry was carried out in 1946 at one centre only, namely, Sarisabari, and a report on it arrived at certain important conclusions bearing on the relation between jute prices in secondary markets and villages within the "pull" of these markets. The Committee, while considering the report at its meeting held in December, 1947, decided that the scheme should be continued for one year from July, 1948. Accordingly, the enquiry will be carried out at the five centres selected for the investigation into the economics of jute growing.

STUDY OF THE INDIAN MARKET FOR JUTE GOODS.

As directed by the Committee, the Director of Economic Research prepared a note and a plan of work for an extensive investigation into the market for jute goods. The Committee approved of the scheme at its meeting held in December, 1947. Work on the scheme will begin as soon as necessary sanction for it is received from the Government of India.

STATISTICAL ANALYSIS OF DATA ON PHYSIOLOGY OF JUTE.

Prof. Sen Gupta's data on physiology of jute for the year 1945-46 were analysed statistically in the Economic Research Section. Some of the results of the analysis were reported to the Committee in December, 1947. A report on the remaining portion of the analysis will be considered by the Committee at its meeting to be held in July, 1948. In pursuance of a decision of the Committee, the Section is also analysing the data for 1946-47.

PROBLEMS OF JUTE INDUSTRY ARISING OUT OF PARTITION OF BENGAL.

The partition of Bengal has given rise to many problems vitally affecting the jute industry of this country. Most of these problems

were investigated in the Economic Research Section at the instance of the Government of India. The Officiating Director of Economic Research, in particular, devoted a considerable part of his time to studying these problems and a series of notes were prepared by him which were forwarded to the Government of India.

FUTURES MARKET FOR LOOSE JUTE.

In accordance with a decision of the Committee, the Economic Research Section has taken up a detailed investigation into the question of a Futures market for loose jute to determine whether it is a practicable proposition or not. A report on the subject is also under preparation.

SUBSTITUTES FOR JUTE.

In pursuance of a decision of the Local Sub-Committee, a comprehensive report on jute substitutes was prepared which traced the history of substitutes since 1926 and analysed the basic causes responsible for their growth. Remedial measures to fight the substitutes were also suggested in the report. The Local Sub-Committee, while considering this report, suggested that the investigation on substitutes should be carried on in close collaboration with the Indian Jute Mills Association. The Director of Economic Research personally discussed the proposal with the Indian Jute Mills Association Research Institute and the latter agreed to it. In a subsequent meeting held in January, 1948, the Local Sub-Committee directed the Director of Economic Research to prepare a comprehensive list of fibres and other materials competing with jute. It was further decided that as the Indian Jute Mills Association was collecting data regarding the quantitative aspect of the question, the Indian Central Jute Committee would also contribute all the data it could collect. The comprehensive list of jute substitutes is under preparation in the Economic Research Section which is also engaged in analysing all data and information relating to the post-war growth of jute substitutes to see how far they have affected the jute trade.

BROCHURE ON JUTE SUBSTITUTES.

All primary and summary tables numbering over 125 have been thoroughly checked, scrutinised and brought uptodate. The brochure is practically complete and will be made ready for publication shortly.

MISCELLANEOUS.

Statistics and information on the jute industry were supplied to various parties including the Food and Agricultural Organization of the United Nations. The material supplied to the Food and Agricultural Organization was published in its report entitled "World Fibre Survey" (1947).

Arrangements have been made to receive reports on the condition of the jute trade from the India Government Trade Commissioners in foreign countries. These reports are published in the Committee's "Jute Bulletin."

PUBLICATIONS.

Several publications were prepared by the Officers and some members of the staff of the Economic Research Section.

MARKETING.

The Indian Central Jute Committee while considering the half-yearly progress report and the Annual Programme of the Marketing Section for the year 1947-48 at its 21st Meeting held in January, 1947, decided as follows :—

"(1) that the two experimental Co-operative Jute Sale Societies undertaken by the Committee should be abolished ;

"(2) that the three Grading Parties of the Committee now working in Bengal, should cease to function and the Government of Bengal should be requested to take them over ;

"(3) that the Committee should continue to disseminate, as at present, the Calcutta Loose Jute Prices to the centres in Bihar, Assam and Orissa for another year ;

"(4) that the scheme of marketing of fibre grown from improved seeds should be discontinued ;

"(5) that the scheme for the study of Indian market with a view to increase the consumption of jute and jute goods should be taken over by the Economic Research Section ;

"(6) that there was no necessity for continuing the work on the organisation of collective sales and co-operative transport in the Sarisabari area as the Society working there had already been disbanded ;

"(7) that the two Co-operative Societies of cottage workers in jute spinning and weaving should continue for the remaining sanctioned period of the scheme ;

"(8) that the scheme of collection of jute prices and other statistics from *mofussil* areas in Bengal should be transferred to the Economic Research Section ; and

"(9) that the work under item 'Miscellaneous' should be carried on by the Marketing Section subject to the modifications in the above recommendations."

2. Accordingly, during the period under report, the Marketing Section was left with the following items of work on its programme :—

I. Experimental Co-operative Societies of Cottage workers in jute spinning and weaving in Bengal ;

II. Dissemination of Calcutta Loose Jute Prices to selected centres of Bihar, Assam and Orissa ;

III. Collection of jute prices from Sarisabari, Akhaura and Jalpaiguri for publication in the Committee's *Bulletin* ;

IV. Publication of Monthly Review of Indian jute markets in the *Bulletin* ;

V. Collection of jute prices from Bihar, Assam and Orissa for publication in the *Bulletin* ; and

VI. *Ad hoc* and trade enquiries.

3. Further work involved was in connection with the Bihar Jute Grading Scheme and the Experimental Co-operative Marketing Scheme in Orissa. Later, (*i*) Preparation of Weekly Jute Market report for submission to the Economics and Statistics Adviser to the Ministry of Agriculture, India and (*ii*) communication of raw jute prices to the same officer on every Saturday were added to the programme of work.

4. The Marketing Section existed as such up to the third week of December, 1947, and during this period Mr. S. M. Gupta, Officiating Marketing Officer held charge of the Section. The Section was amalgamated with the Economic Research Section and placed under the Director of Economic Research in pursuance of the decision of the Committee at its 22nd meeting held in December, 1947.

5. A brief summary of the work done during the year under review is given below :—

CO-OPERATIVE SOCIETIES OF COTTAGE WORKERS IN JUTE SPINNING WEAVING IN BENGAL.

12 members were enrolled to the Domar Society and only 8 to the Setabganj Society during the year under review. The slow progress is attributed to the uncertainty of their future working as a result of partition of Bengal. The following statement will show the final position of the two societies :

	Members actually enrolled.	Share money collected.	Admission fees collected.
		Rs.	Rs.
Domar Society ..	343	459	172
Setabganj Society ..	268	273	134

6. All arrangements regarding assembling and marketing of 'hessian strips' progressed satisfactorily and the Societies approached the Government of Bengal with the request to make available to each of them the sanctioned working fund of Rs. 5,000. But, meanwhile the previous financial arrangement was upset by the announcement regarding partition of Bengal according to which both the Societies fell within Eastern Pakistan. The Societies were, therefore, asked to approach the East Bengal Government for advancing the required working capital, failing which they were advised to approach either the Central Co-operative Banks or individual members of the Societies. But, as the Societies failed to receive favourable response from any quarter and as the Government of India in the meanwhile intimated that they were not in favour of carrying out any work outside their territorial limits, the Committee withdrew its support from them, with effect from the 31st December, 1947.

DISSEMINATION OF CALCUTTA LOOSE JUTE PRICES.

7. During the year under review Calcutta Loose Jute prices were sent out daily through the Publicity Section of the Committee to 21 centres in Assam, 9 in Bihar and 4 in Orissa. As before, prices were collected from two local broking firms and were communicated by ordinary post to the local officers of the Provincial Government who were responsible for proper dissemination of the same.

8. The previous decisions of the Committee, *viz.*, that, "(*i*) the service should continue till the end of March 1948 ; in the meantime, the Provincial Governments should be asked to inform the Committee if they wanted the continuance of the service, and that if they did, (*ii*) the variations in price should be communicated to the different Provincial Governments by telegram in order to keep them informed of the latest Calcutta prices" were communicated to the Provincial Governments concerned enquiring from them as to what they would desire the Committee to do in the matter. In reply they desired that the service now be continued.

COLLECTION OF JUTE PRICES FROM SELECTED CENTRES OF BENGAL.

9. Loose jute prices as offered by balers were collected on daily basis through the District Agricultural staff posted at Sarisabari

(Mymensingh), Akhaura (Tippera), and Jalpaiguri. They were then tabulated and published in the Committee's *Bulletin*. Consequent on the partition of Bengal, however, collection of this information from Sarisabari and Akhaura was discontinued.

PUBLICATION OF MONTHLY REVIEW OF THE INDIAN JUTE MARKETS IN THE BULLETIN.

10. As before, preparation and publication in the Committee's *Bulletin* of a monthly Review of the Indian Jute Markets formed a regular feature of the routine work of the Section during the period under report.

COLLECTION OF JUTE PRICES FROM BIHAR, ASSAM AND ORISSA.

11. Baler's Loose Jute prices were collected from Gulabbagh (Bihar), Kendupatna, Danpur and Marshaghai (Orissa) during the year under review. The information for Gulabbagh was supplied by the Jute Overseer, Purnea ; while that for the Orissa centres, it was supplied by the Supervisor of each of the Societies operating at these centres. No information was, however, collected from Haibergaon (Assam) as there was no suitable staff at the locality owing to the abolition of the Provincial Marketing Department.

AD HOC AND TRADE ENQUIRIES.

12. Information relating to the number of *pucca* baling presses and the cost of preparing *pucca* bales was collected and furnished to the Ministry of Commerce, Government of India. Several enquiries regarding jute prices, trend of markets and distribution of export quota for raw jute and jute goods were received from various sources and were disposed of during the year under review.

MISCELLANEOUS.

13. The Jute Grading Scheme in Bihar and the Co-operative Marketing Scheme in Orissa which were however conducted under

the direct supervision of the Provincial Governments were on the programme too. The Officiating Marketing Officer inspected the work of the Bihar Grading Party in November, 1947 and supplied information relating to the market trend to the Senior Marketing Officer, Orissa from time to time. Besides, the request of the Economics and Statistics Officer, Department of Agriculture, India weekly raw jute market report and Saturday prices for raw jute were regularly supplied to his department—the former being sent from September while the latter was sent from February onwards.

PUBLICITY.

The progress of work, inspite of the Publicity Officer's enforced absence due to serious illness during the first half of the year under report, was fairly satisfactory. A resume of the work done is given below :—

(1) *The Jute Bulletin* :—Except during the earlier part of the year, the Committee's monthly journal whose name was changed from *Bulletin* to *Jute Bulletin* was published regularly and continued to maintain its increasing popularity and demand both inland and overseas.

(2) *Press Propaganda* :—The Publicity Section issued during the year, 30 Press and Unofficial Notes dealing with various aspects of jute and Committee's activities. These received wide publicity in India and abroad.

(3) *Radio Publicity* :—Extracts from important Press-Notes issued by this section continued to be broadcast by the Calcutta Station of All India Radio.

(4) *Price Dissemination* :—The Publicity Section continued disseminating daily quotations of the prices of raw jute in the Calcutta market to 36 centres in Bihar Assam and Orissa, and to 34 centres following the partition of the country.

(5) *Sale and Distribution of the Publications of the Indian Central Jute Committee* :—Excluding the *Bulletin*, this section sold 660 copies of the various publications of the Committee and distributed 668 copies of the same free.

(6) *Establishment of the Central Jute Museum* :—Encouraging progress has been recorded in the setting up of the Central Jute Museum, and some useful posters and charts on the economic, marketing and botanical side of jute and other technical aspects have been prepared, and a large variety of specimens of jute products and botanical exhibits collected. These are now housed at headquarters covering a floor space of about 1,424 Sq. ft.



CHAPTER IV.

GENERAL.

SPECIAL AGRICULTURAL STAFF.

The Committee's Special Agricultural Staff in the provinces of Bihar, Assam, Orissa and undivided Bengal continued to function as hitherto and carried on work under the control of the Provincial Departments of Agriculture according to the programme of work laid down by the Committee till August, 1947. The Government of India held that as the staff was employed mainly on developmental work, the Committee should no longer finance it. Accordingly funds were not made available to the Committee to finance the scheme beyond the 31st August, 1947. The decision of the Government of India was notified to the Provincial Governments and the Committee ceased to finance the scheme from the 1st September, 1947.

As mentioned in Chapter I, the Committee at its last meeting decided that all efforts should be directed to increase the production of jute in the Indian Union and recommended that the scheme of employment of special Agricultural Staff in the jute-growing provinces of the Indian Union should be revived forthwith in aid of an all-out drive for increased production of jute. In accordance with this recommendation of the Committee, the Government of India sanctioned the revival of the staff from January last. The staff in Bihar, Assam and Orissa began functioning from that month. A scheme for organising a new complement of staff in West Bengal is under the consideration of the Committee.

The expenditure on this staff during the year was :—

Bengal (undivided) and West Bengal				Rs. 51,005
Bihar	..	..	..	Rs. 9,549
Assam	..	..	..	Rs. 6,326
Orissa	..	..	..	Rs. 3,465
				70,345

CHAPTER V.

ACKNOWLEDGEMENT.

Secretary is grateful to the President Sardar Bahadur Sir Datar Singh, Vice-Chairman, Indian Council of Agricultural Research and Additional Secretary to the Government of India, Ministry of Agriculture and to the Vice-President, Mr. I. G. Kennedy, C.B.E. for the valuable advice and guidance received from them. The assistance given by the members of the Local Sub-Committee during the year was invaluable and Secretary acknowledges with gratefulness the advice tendered by them on many intricate problems that cropped up during the year. The Committee continued to receive the same co-operation and assistance from the Provincial Governments and the Indian Jute Mills Association as in the previous years. Secretary also conveys his thanks to the Sectional Heads, research workers and the members of the staff of the different Sections of the Committee, whose co-operation, hard work and devotion to duty contributed to the success of the administration during the year.

G. C. SEN,
Secretary,
Indian Central Jute Committee.

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ANNUAL REPORT OF THE AGRICULTURAL RESEARCH SCHEME 1947-48.

GENERAL.

Probably no other research institute has been more affected by the partition of India than the Jute Agricultural Research Laboratories of the Indian Central Jute Committee. Since its inception in 1939 the central station of the Institute at Dacca with sub-stations in the important jute growing districts of East Bengal was equipped, organised and developed through the untiring efforts of the members of its staff, but all to be occupied by the Pakistan Government. All the improved seeds evolved as a result of more than 8 years' hard labour, papers containing important experimental data, rare apparatuses that were collected during the last 8 years, and so many other things are now all lost to us. Experiments that were in progress for a number of years and were expected to yield important results shortly had to be abandoned. The whole set of genetic materials that was built up by year to year collection had all to be left back.

The future of the Jute Agricultural Research Laboratories was decided by the Indian Central Jute Committee in December, 1947, long after the partition of the country had been announced. The decision of the Government of India to develop a first class Jute Agricultural Research Institute in the Indian Union was arrived at also in December, 1947. During the uncertain period that intervened between the partition of the Country and the decision of the Committee a number of responsible members of the staff who were associated with the work of the Laboratories since their inception sought for jobs elsewhere and were absorbed by other departments.

The loss of all valuable seeds, rare apparatuses, important experimental data and records of past years along with the loss of a number of experienced officers have made the reconstruction of the Institute in the Indian Union a very difficult task for us.

Lack of data and absence of persons, who were incharge of the work carried out in the different sections, presented enormous difficulties in giving a shape to the present report which is more

a statement of the exact state of affairs than one of the progress made during the year under report.

SEASON.

At Dacca, the land allotted to us was released rather late in the season. Preparatory tillage was, therefore, delayed and sowings could not be taken up before the end of April and was completed by the first week of June. Frequent showers of rain interfered with the first weeding and thinning. Attendance of labourers needed for the purpose was again sparse due to the communal tension that reached its peak during this period. As a result of all these the jute crop could not be taken care of at a time when it was to be tended most. Some of the trials that were over-grown with weeds had to be rejected. The stand-still order that came later put further set-back on the work that was in progress.

At Kishorganj the season and other conditions were favourable. Sowings were completed in time and intercultures carried out under favourable conditions. Nine trials out of twelve were harvested and seeds were collected as scheduled.

At Narayanganj sowings and intercultures were completed under favourable conditions. Harvesting was delayed due to paucity of labourers caused by communal troubles. One trial was destroyed by flood water. Seeds were collected from the rest of the trials.

At the low-land substation of Konda sowings and subsequent operations were carried out as usual. The condition of the crop was fairly good. All the trials were harvested in time, but flood water and water-hyacinth destroyed the bulk of primary and secondary selections that were left in the field. Seed collection was extremely poor.

I. COLLECTION OF VARIETIES AND TYPES.

In absence of the seed register it is difficult to say exactly how many types were collected earlier and sown during the season. Fresh collections made by us during survey tour of Assam, West Bengal, Bihar and Orissa numbered 121 of which 95 *were Capsularis* and 26 *were olitorius*. To these were added a collection of old seeds of some of the types that we had in our list at Dacca.

II. BREEDING OF JUTE.

Fifty five breeding and varietal trials in all were put at Dacca and at the substations. Experimental data regarding these and most of the seeds obtained from these trials were left back. Tests of the few selections available to us will be undertaken during the coming season.

Small bulk trial.—Seeds of the improved *olitorius* strains were supplied to the Economic Botanist, Bengal, in-charge of Fibre Section, for multiplication in the district farms. It is not known what happened to the seeds obtained from these strains. Some old material available to us are being multiplied at the Chinsurah Farm during the coming season.

Early varietal trial.—The early varieties were tested for the third year at Belakoba. The yield data being left at Dacca could not be analysed.

Report of 1947 quality tests on the varieties received lately shows that our strains except 321 have maintained the higher quality ratio as compared with the locals. They are 84 to 86 as against 74 and 77 of the controls.

Multiple crossing.—More than 2000 selections were made in the various groups of the multiple crossing materials. All were lost to us. Work will be continued with some old material available to us.

Selection for resistance to stem-rot.—Sixty progenies representing 12 families were tried in two compact family block trials. The crop was damaged by miscreants and no seeds could be collected. Reserve stock of seeds could not be brought from Dacca.

Polyploidy and interspecific hybridization in jute.—Seeds soaked in various concentrations of colchicine for different periods did not germinate in the field. The seedlings obtained under laboratory conditions also failed to survive.

Internode length and its correlation with ultimate fibre length.—Six varieties including R 26, C. G., D154, Fanduk, Jap G and Maniksarai were sown in replicated row-plots. Measurements and other data

were kept as scheduled at regular intervals. The data could not be brought from Dacca.

Vegetative rapprochement as a means of overcoming interspecific cross-incompatibility in jute.—Seeds collected in 1946 were sown and plants were obtained but circumstances did not permit undertaking of further work.

Effect of date of sowing on plant-growth, flowering and fibre yield.—Sowings were carried out on different dates as scheduled and germinations were good but for reasons already stated intercultures could not be given timely and as a result the crop failed.

Subvention trials.—The three improved *capsularis* strains—C39-212, C41-13 and C42 Nj-412, evolved at the Jute Agricultural Research Laboratories, were tested in subvention plots against the locals under cultivators' condition for the third successive year at 94 centres (60 in Bengal, 12 each in Bihar and Orissa and 10 in Assam) over a wide range of soil and climatic conditions. Results of only 16 trials (12 of Bihar and 4 of Assam) were obtained and analysed yielding informations as given below :—

BIHAR.

Variety.	Average yield per acre Maund.	Percentage on control.
C39-212	14.72	112.4
C41-13	13.64	104.1
C42 Nj-412 ..	13.41	102.3
Locals	13.10	100.0

Yield above is just short of the 5% level of significance. The favourable opinion of the cultivators in respect of C39-212 is corroborated by actual high yield of the strain as shown above. In Bihar this strain may be released to replace the locals. C42 Nj-412 has been found to be rather susceptible to stem-rot. In seven out of twelve trials it was noticed to have a high percentage of disease. In future planning of subvention trials for Bihar this strain will be replaced by another improved strain from our stock.

ASSAM.

Variety.	Average yield per acre. Maund.	Percentage on control.
C42 Nj-412 ..	13.1	117.7
C39-212	11.3	101.9
C41-13	10.9	98.4
Locals	11.1	100.0

Curiously enough C42 Nj-412 has been giving fairly good yield in Assam though difference in yield as shown above is not significant. Again under Assam conditions this strain is not reported to be strikingly affected by disease.

BENGAL AND ORISSA.

No results were obtained from trials carried out in these two provinces.

Seeds multiplied by the Department of Agriculture, Bengal, in their district farms for the purpose of subvention trials in the four provinces during 1948-49 could not be brought. Hence the programme of subvention trials for the said year was dropped. Arrangements have been made for multiplication of the already tried and other promising *capsularis* and *olitorius* strains from small quantities of seeds we had in our possession.

A fresh scheme of subvention trials will be prepared on the basis of the results of previous years and also on the quantity of seeds to be obtained from our multiplication plots at the Chinsurah Farm.

III. INHERITANCE OF CHARACTERS.

During the year under review little progress could be made in genetical investigations.

Awned-petal in *olitorius* culture was found to breed true. It was crossed with ordinary flower. No seed could be collected.

Blotching on *olitorius* leaves was found to occur in intense to light form on both lightred and deepred plants. Materials will be isolated again.

Investigations on the cluster habit of pods were completed. All data had to be left back at Dacca.

IV. CULTIVATION.

Line sowing of jute.—To study the economics and output of fibre of line versus broadcast sown jute, 4 trials were repeated at Dacca, Kishorganj, Chinsurah and Rangpur as in the previous year. Data from these trials are not available, hence no results can be given.

Efficient wheel-hoes used in the past are not available in the market. Study of the economic aspect of jute cultivation during the ensuing season may be difficult.

Seed rate and harvest stage.—On account of various difficulties the harvest of 'bud stage' of the experiment could not be taken up. The trial had, therefore, to be abandoned again. A portion of the standing crop was harvested later and sent to Messrs. William Jacks & Co., of Calcutta on request for a trial in America in a decorticating machine invented by a certain American firm.

V. ANATOMICAL & CYTOLOGICAL INVESTIGATIONS.

Investigations on chromosome structure and morphology of the seven types, *viz.*, Kalichar, Deodhali, Halmahera, Jap G, C. G., R 26 and *C. auxillaris* were continued. Blocks and permanent slides were prepared for study. All the slides together with a good number of paraffin blocks, sketch drawings and notes were left at Dacca.

All slides prepared for study of cytology of the V2 mutant together with drawings and notes were left back at Dacca.

Cytological studies will be continued as an aid to the study of genetical problems and to the breeding of jute.

VI. QUALITY OF JUTE.

Experiments on retting technique were in progress according to programme, but these had to be abandoned. The data, which were incomplete, are not with us.

VII. BIOCHEMICAL STUDIES.

Elaborate experiments were taken up to confirm the findings of the previous year in respect of decomposition of jute plants during the process of retting, nitrogen transformation in jute soils and its utilisation by jute plants and of microbial changes taking place in the soil during the culture of jute.

A good number of bacterial and fungal cultures were obtained and were being maintained for further studies. Chemical analyses of retting water and jute soils were carried out yielding important data. But all bacterial and fungal cultures and the papers containing all relevant data were left at Dacca.

Works on similar lines are proposed to be repeated.

VIII. DISEASES.

Stem-rot caused by *Macrophomina Phaseoli*

Study of the fungus.—The 50 type cultures which were being maintained for physiological studies have been left at Dacca.

Control of the Disease

Seed treatment and storage—Laboratory experiments on seed treatment and storage were carried out with Agrosan-G and Granosan. Specific data that are not available now, seemed to indicate possibilities for storage of jute steeds after treatment.

Effect of sprays against secondary infection.—The effect of Perenox spray on spores was studied under laboratory conditions. Mature spores germinate readily in distilled water at 35°—37°C temperature. Their germination was inhibited by 0.25% solution of Perenox sprayed by an atomizer.

Manurial trials.—The experiment was repeated for the third year at Dacca and at Kishorganj. The crop at Dacca was damaged by miscreants while the data of the Kishorganj trial were left there. Results similar to those indicated in previous years in response to treatments of N & K were obtained.

IX. PESTS.

The White mite (*Tarsonemus latus* Banks).

Control measures.—Results obtained last year under laboratory conditions were tried in the field. Four different treatments with lime-sulphur and rosin-fish-oil-soap solution were tried on replicated trials. Field conditions were unfavourable for inducing white mite infection which took place in late June. Preliminary observations indicated that morning sprays of rosin-fish-oil-soap solution followed by lime-sulphur dusting was effective against Nymph and adults. Further data are not available.

Mealy Bug (*Ferrisia virgata* CKII.)

For a fuller knowledge of life history of this common mealy bug certain points were reinvestigated but the data were all left at Dacca.

Control measures.—In addition to Nicotine sulphate solution 5% D. D. T., Gammexane D. 025 and D. 034 were tried both as sprays and dusts. Positive results were obtained by application of gammexane D. 025 and D. 034 under laboratory conditions, but the data cannot be supplied.

Jute Buprestid (*Trachys pacifica* Kerr).

Control measures.—Nicotine sulphate, 5% D. D. T., Gammexane D. 025 and D. 034 were tried against eggs, grubs, pupae and adults of the pest. Nicotine sulphate proved most effective against eggs. Both D. 025 and D. 034 of gammexane had some effect on adults.

Breeding of Braconid parasite could not be effected on a large scale. Biological control on field scale was therefore not undertaken. Important points of the life history of the parasite were known.

Pest and disease control scheme at Narsingdi

The pest and disease control scheme on a 'pilot-plant' scale was started in the year 1943 for trying out various control methods for pests and diseases under cultivators' conditions.

Cultivators in larger numbers wanted to be included within the scheme, but we had to restrict the area within 75 acres of land keeping in view the resources available to us. Communal tension that spread to Narsingdi area created much bitterness amongst the local people and at times made it difficult to work. Demonstration of our control measures were however carried out against odds and they proved to be highly satisfactory.

For the first time this year Bordeaux mixture was used against leaf infection. The results are inconclusive, but there were indications that Bordeaux might prove useful at an early stage of secondary leaf infection.

X. NEW JUTE AGRICULTURAL RESEARCH INSTITUTE.

According to the policy laid down by the Government of India and after the decision taken by the Indian Central Jute Committee the new Jute Agricultural Research Institute is being reorganised with a farm at Chinchurah and with the laboratories in a rented house at Hooghly. The land has been obtained from the Bengal Government and our thanks are due to them.

Farm.—Formal possession of the land at the Chinsurah Farm was taken on 7th March 1948 and field operations started on 10th March 1948. The total area of the land obtained is classified as follows :—

		Acres.
1.	Area under cultivation ..	33.9
2.	Low land	9.4
3.	Marshy land	3.6
4.	Tank	1.1
5.	Roads, drains, etc.	4.7
		52.7

Of the 33.9 acres of land under cultivation about 3 acres have been allotted to the Economic Botanist, West Bengal, for his Kharif cropping scheme and an area of a little less than an acre has been retained by the Farm Manager. There are also 3 acres of perma-

nent grass plots. Of the 9·4 acres of low land about an acre has been utilised for double cropping experiment. Net area under our cultivation this year is about 28 acres.

The whole of the farm was practically laid out for the purpose of growing paddy. There was a large number of small plots with bunds raised all around for holding rain water needed for puddling. We had to change the lay out and make bigger well drained plots measuring roughly one acre each.

Laboratories.—The reorganisation and equipment of the laboratories involve a huge task. It is practically impossible to secure all the apparatuses and chemicals that we require for our purpose. However every attempt is being made to secure as many as possible from different parts of India and from abroad. It is expected that the laboratories may be properly fitted by August next.

Staff.—Staff for the Institute are being recruited according to the Reorganisation Scheme. Most of the posts lying vacant due to the resignation of a number of members during the critical period and some new posts under the reorganisation scheme were advertised and suitable persons have been selected who are expected to join shortly. The following new appointments have also been made during the year under report.

Mr. B. Das Gupta, Scientific Assistant, has been promoted as Assistant Botanist with effect from the 1st January 1948.

Mr. T. Ghosh, Mycological Assistant, has been promoted as Assistant Mycologist with effect from the 1st January 1948.

XI. MISCELLANEOUS.

The following members of the staff resigned and joined other departments.

1. Mr. R. L. M. Ghosh, Botanist, who has been with us since the inception of the Jute Agricultural Research Laboratories left us in December 1947 and joined the Rice Research Institute as Geneticist and Botanist.

2. We were extremely sorry to lose Mr. A. T. Sanyal, Superintendent, Kishorganj Outstation. He had been with us since the

inception of the Jute Agricultural Research Laboratories and was one of the most outstanding workers. He joined the Indian Central Tobacco Committee as an Agronomist.

3. Dr. G. M. Das, Assistant Entomologist left us in December 1947 and joined as Entomologist of the Toklai Tea Research Station of the Indian Tea Association.

4. Dr. A. C. Bose, Assistant Chemist, left us in December 1947 and joined the Central College of Agriculture as Professor of Agricultural Chemistry.

5. Mr. K. R. Rao, Assistant Botanist, left this Department in November 1947 and joined the Forest Research Institute, Dehra-Dun as Assistant Wood Technologist.

6. Mr. N. R. Datta Biswas, Microbiological Assistant, joined the Chemical Division of the Indian Agricultural Research Institute in December 1947.

7. Mr. T. D. Mukherjee, Entomological Assistant, joined the Entomological Division of the Indian Agricultural Research Institute in November 1947.

8. Mr. J. Dutt, Junior Botanical Anatomist, left this Department and joined the Editoral Department of the Dictionery of Economic Products at New Delhi.

9. Mr. A. R. Gomez, one of the office clerks, a fast and dependable typist, has remained in Pakistan.

PUBLICATIONS.

The following is a list of papers published during the year under report :—

1. Ghose, R. L. M., Rao, K.R., and Kundu, B. C.—The Genetic of Corchorus (jute) V. The inheritance and linkage relation of bitter taste, anther and corolla colour. Journal of Genetics, (sent for publication).

2. Ghose, T., Kundu, B. C. and Basak, M.—Effect of sunning and chemical treatment in relation to storage of jute seed—Proceedings of the Science Congress Association, 1948.

3. Kundu, B. C.—Possibilities of increased production of jute in the Indian Union. Jute Bulletin, January, 1948.

4. Das, G. M.—Insect and mite pests of jute (sent for publication) .

5. .. .. .. Biologic of Euplectrus Gopimohani Mari, a larval parasite of Laphygme exigua, Rfn. (sent for publication).



B. C. KUNDU,
Director.

APPENDIX.

Programme and Progress of Work.

Programme of work as sanctioned. (1)	Progress made. (2)	Nature of future work. (3)
1. Collection of varieties and types.	95 *capsularis* and 26 *olitorius* types were collected from Assam, Bihar and Orissa. These will be grown along with old materials in our possession and studied.	A systematic collection of types from unrepresented jute growing areas will be made. The materials will be studied and a collection of the promising types will be maintained.
2. Breeding of improved strains of jute.	55 breeding and varietal trials were conducted, but the study could not be completed.	A large number of fresh selections will be made and tested for yield.
	Seeds of improved *capsularis* and *olitorius* strains multiplied for the purpose of subvention trials had to be left back. Subvention trials during 1948 had to be dropped for want of sufficient seeds.	Position of seed of the improved strains will be reviewed at the end of the coming season and a fresh

Programme of work as sanctioned. (1)	Progress made. (2)	Nature of future work. (3)
		scheme of subvention trials will be drawn up.
	All the selections from the Multiple crossing materials were lost to us at Kishorganj. Work will be continued with some old materialavailable to us.	Sifting of the materials for early, high-yielding and disease-resistant fixed strains will continue.
Polyploidy and interspecific hybridization in jute.	Seeds treated with Colchicine failed to germinate in the field. Some seedlings obtained under laboratory conditions did not survive.	Treatment of seeds and seedlings of *capsularis* and *olitorius* types with Colchicine will be repeated on an elaborate scale. If polyploids are obtained, interspecific crosses will be attempted.
Internode length and its correlation with ultimate fibre length.	Six varieties were studied. The data were left at Dacca.	A fresh scheme will be drawn up later.

Vegetative rapprochement as a means of overcoming interspecific cross incompatibility in jute.	Seeds collected in 1946 were grown, but no further work could be undertaken.	Grafting with either species as scion will be attempted this year ; if successful, seeds will be collected from these grafts for further work.
Effect of date of sowing on plant growth, flowering and fibre yield.	Sowings were carried out as scheduled but the crop could not be taken care of.	Conditions at Chinsurah do not permit undertaking of this experiment under natural conditions. The experiment will be tried in Assam when the proposed substation is opened.
Varietal differences of fibre content in jute and breeding high fibre-yielding strains.	All records have been left at Dacca	Work will be taken up as soon as the Laboratories are properly fitted.
3. Mode of inheritance of characters.	Little progress could be made in genetical investigations. Flowers with awned-petal in *olitorius* were crossed with ordinary flower. No seeds could be collected. Blotching observed on *olitorius* leaves and cluster habit of pods in *C. auxillaris* could not be studied further.	Almost all the genetic strains collected during these years have been lost. A fresh collection will be made from year to year isolation of distinct types observed in materials under study. Programme of study of inheritance of new

Programme of work as sanctioned. (1)	Progress made. (2)	Nature of future work. (3)
		characters will be drawn up from itme to time.
4. Cytological investigations	Progress was made in investigation on chromosome sturcture and morphology of seven types and on cytology of V2 mutant. Many blocks, slides, sketches and notes prepared had to be left back at Dacca.	Investigations as in (1) will be continued.
5. Investigations on retting technique.	Experiments were undertaken according to programme, but these had to be abandoned mid-way.	As in column (1).
Biochemical studies of (1) the retted jute, (2) retting water and (3) soil.	Good progress was made on the three items of work as in column (1), but all bacterial cultures and the data were left at Dacca.	As in column (1).
6. Formation of fibre ..	No progress could be made. Materials fixed were left back.	The study will be taken up again.

7. Influence of seed rate, stage of harvest and duration of retting period on yield and quality.	The 'bud-stage' of the experiment was missed for reasons already stated. The experiment had to to be abandoned.	The experiment will be split up into two simple experiments of much smaller size and the investigations as in column (1) carried out.
8. The possibility of line sowing of jute.	4 trials were conducted at different centres. No data are available from any of these trials.	The study will be continued.
9. Spacing and manurial requirements of seed jute.	No result of the trials carried out during the year are available.	The study will be continued.
10. The study of the effect of environmental factors on secondary infection of stem-rot.	Records from different field trials were being gathered. Some laboratory experiments on spore germination were undertaken.	Will be continued under Chinsurah conditions.
11. Study of the Stem-rot fungus.	All type collections have been lost.	New types will be isolated and a herbarium will be set up.

Programme of work as sanctioned. (1)	Progress made. (2)	Nature of future work. (3)
12. Investigation on the methods of control of stem-rot and root-rot diseases.	Perenox was tried as a spray. It was found successful in inhibiting the germination of spores. Seeds collected from the progenies of resistant selections under study could not be brought.	As in column (1).
	Effect of fertilizers on the incidence of disease was studied. The data were left at Dacca.	
13. Investigations on the control measure of jute Apion.	Seeds of types resistant to Apion attack selected in 1946 were sown, but no collection could be made in 1947.	Selection will be taken up again.
14. Investigation on the control measures for other pests.	Lime-sulphur and fish-oil-soap solution were found effective against white mite nymphs and adults.	As in column (1).
	Gammexane D. 025 and D. 034 and D. D. T. at 5% were also tried against two pests of jute and found effective at certain stages in the life-history of the pests. No data are available.	Collection for herbarium and museum.

ANNUAL REPORT ON THE TECHNOLOGICAL RESEARCH SCHEME FOR 1947-48.

Introduction.

In this report the same general outline is followed as last year, the programme remaining substantially as before. The bench-work and part of the furniture for the extension rooms have been received and the portion intended for chemical technology will be ready for use as soon as the branch piping and floor drains have been completed. The hessian system finisher card has been reerected in the other portion of the extension and the gill spinners will be transferred there from their temporary position in the batching room as soon as possible.

Special attention is called to the remarks made in this report on the importance attached to the mesh structure of the fibre system of the jute plant and the desirability of breeding strains in which this is as simple as possible. Emphasis is also placed on the need for breeding strains of jute with a high percentage of fibre in each plant.

The Laboratories have now been in full operation for a little over nine years. Work, as was originally planned, has had mainly an agricultural and raw-material background, both in its applied and fundamental aspects, but at the same time much has been done that is of direct interest to mills, and still more that can be made use of through trade research associations throughout the world or through mills' or manufactures' own scientific staffs. It is felt that the knowledge gained will form an excellent basis for further work in more extensive fields, and with more direct applications for the manufacturer, and at this stage it would be appropriate for such work to occupy a larger part of our attention. Consequently if the proposed Reorganisation Scheme is now given effect to the position would appear to be very favourable for good progress on items of work covering increased uses for jute and improvement of processes,

to which it has so far been possible to devote only meagre attention. Almost everything must depend on our success in recruiting suitable workers.

A circular has been sent, through the Chief Chemist, Indian Jute Mills Association Research Institute, to all members of Indian Jute Mills Association, pointing out that the facilities available in T. R. L. and the information that has been gained are not being made full use of by the Calcutta trade. The circular indicates the various kinds of assistance that can be given. We are always ready to discuss problems and suggestions for items of work with trade representatives.

1. SPINNING TECHNIQUE.

There are no new developments to report ; we are now well equipped with methods suitable for the spinning of small samples. The method described briefly in the last annual report using only 2 lb. of cut jute has proved useful when samples of very small size were submitted for test.

2. BACKGROUND RESEARCH.

Tensile strength of twisted bundles of fibre

In the work so far done on the prediction of spinning quality from the physical characters of the raw material the tests have been mainly carried out on bundles of fibre-strands obtained by combing the raw material. One of the characters that links up fairly closely with spinning quality is the ballistic work of rupture of twisted bundles of fibre-strands. For some time it has been realised that an even closer relationship may exist between the tensile strength of twisted bundles of fibre and spinning quality but there were difficulties in devising the details of a suitable apparatus. After a considerable amount of experimenting a device has now been constructed in the T. R. L. workshops for putting the desired twist into the bundle and clamping it in the testing machine without change of twist. For this work a ply-yarn tester of 500 lb. capacity is used. Systematic trials have not yet been carried out with the new apparatus but it is functioning well, with the breaks normally occurring well away from the clamps, and it is anticipated that valuable data will be obtainable.

Frictional characters.

A simple apparatus was made for the examination of the behaviour of a pad of combed fibre resting on a second pad attached to an inclined plane. In the tests the slope was gradually increased until slipping occurred. Tests were made (*a*) with the fibres in each pad parallel and (*b*) with the fibres at right angles. The co-efficient of friction was invariably higher when the fibres were parallel, due presumably to the greater entanglement of the fibres in the two pads, but no clear relation with spinning quality was found, although there was a slight tendency for better regularity to go with a low coefficient of friction and with a low fractional standard error of the coefficient of friction. These are important indications.

A second method for examining frictional behaviour has recently been studied. In this method the load necessary to cause the slipping of or bundle of fibres twisted round a second bundle is determined. It is too early to report any results.

Since high friction is desirable between the strands once the yarn has been made and a low (and uniform) friction is desirable during drafting it is perhaps not surprising that so far only a vague connection with spinning quality has been seen, but a connection with regularity is to be expected and further experiments are being made in which batching emulsion is first applied in tests made by the pad method.

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Hardness of Jute Fibre

An apparatus was constructed in which single strands of jute fibre could be locally compressed between a supporting table and a pressing foot under a known load. Using the apparatus, estimates of hardness have been obtained by observing the increase in diameter produced in the region of the pressure. The work is in its early stages and so far no clear relationship with spinning quality has been found. Some modifications of the apparatus in the light of the experience obtained are to be made.

Other work with Single Strands

Preliminary experiments were carried out for a study of the 'creep' properties of jute fibre, that is, the extension produced by small constant loads acting for some time and the recovery after

unloading. Some work was also done on the torsional rigidity of single strands.

Extensibility of Yarn and Fibre

It is well known that jute fibre has a low extensibility. It probably ranks lowest in this respect of all the important bast fibres. The extension at break of single fibre strands has been given as about 1.8 per cent. This compares with about 3.0 per cent for flax, while for cotton the figure is 7.0 per cent or more.

Data obtained from a series of commercial yarn samples (T. R. Memoir No. 4) show that the breaking extension of jute yarns is also very low and that it does not vary much among yarns of a given grist and breaking load (*Cf.* I.C.J.C. *Bulletin*, March, 1948). For this reason a study of the elastic behaviour of jute fibre-strands was not undertaken in the investigations so far made on the prediction of spinning quality from the physical fibre characters of the raw material. It is considered desirable, however, to take up the subject at this stage in order that any information obtainable from this fundamental character may not be overlooked and accordingly an apparatus suitable for the study of elastic behaviour is in course of construction.

The extension at break of a 10 lb. jute yarn of average strength and normal twist-factor is of the order of 1.8 per cent and for 10 lb yarns of 11.0 twist factor and breaking load 8.5 lb. (24in. test length) is not very likely to be outside the range of 1.4 to 2.2 per cent with white jute yarns. For tossa yarns of similar strength the percentage breaking extension tends to be lower, an effect that may be partly due to the greater compactness of tossa yarns. The ratio of breaking load to percentage breaking extension increases on passing from finer to coarser yarns if the same twist factor is employed. With increasing twist factor on yarns of the same grist the ratio of breaking load to percentage breaking extension decreases steadily.

Yarn Diameters.

The measurement of yarn diameters is of importance in a number of connections. Firstly we have the fact that variation on diameter from point to point is a fundamental index of yarn irregularity. Secondly, there is a fairly close connection between the spinning quality of jute fibre and the average diameter of a yarn spun from it by a standard process. Thirdly, a knowledge of yarn

diameters is important as regards cloth constructions, for example in attempts to calculate the greatest number of picks of a particular yarn that can be inserted into a cloth with a specified warp. Fourthly yarn diameters have an important bearing on the construction, of ply-yarns.

We have, however, to consider exactly what we mean by 'yarn diameter' and it is soon seen that a precise definition is by no means easy to arrive at. The difficulties arise mainly from the following factors :—(*a*) Yarns are readily compressible, (*b*) they are not strictly circular in cross-section, (*c*) the surface is indefinite owing to the presence of loose strands of fibre. The last factor renders measurements under the microscope, or other optical methods using single threads of yarn, rather unreliable. The diameter could be calculated if the yarn counts and its bulk density were known. The latter can be estimated, following the method of J. A. Matthew, by soaking the yarn in oil, thus replacing the internal air by oil, and finding the volume of the oiled yarn by the displacement of water. A modified oiling method, in which personal errors are reduced, has given satisfactory results in T. R. L.

Some other methods investigated in T. R. L. have been referred to previously and recently a comparison of the results obtained in four different methods has been made, using yarns of several qualities. In addition to the microscope and oiling methods just referred to we have used a method in which a number of strands of the yarn under test are arranged on the surface of a cylinder, parallel to its axis, and a fine thread, or wire, is wound helically on to the cylinder under a standard low tension. The yarn diameter is easily calculated from the difference in length between a specified number of turns of the winding thread wound on to the plain cylinder and the corresponding length when the yarn is mounted on the cylinder. A fourth method consists in twisting a number of strands of yarn together under standard conditions and measuring the overall diameter of the composite assembly with an optical projection apparatus. Here the loose surface strands cause less uncertainty because of the greatly increased overall diameter. An interesting method of estimating the single strand diameter from the overall diameter has been worked out.

It might be thought that a very simple method of estimating yarn diameter would be to arrange a number of threads side by side and observe the overall width. One difficulty, is however, to ensure

a standard degree of lateral pressure where the threads touch. Moreover, if the threads are arranged on a plane surface thin lengths tend to tuck under thick lengths. That is to say, it is difficult or impossible to arrange the axes of all the threads in the same plane, as is necessary ; with irregular yarns this is a very serious difficulty. A further method that has been considered is to find the length and weight of yarn required to fill a bobbin of specified size. The main difficulty here arises from the uncertainty in the nature of the packing of layer upon layer.

The cylinder or thread-winding method is perhaps the most direct and most suitable when the effective diameter of yarns in relation to cloth structure is under consideration. The winding thread can be applied under various tensions and information obtained regarding the compressibility and deformation of the yarn.

Yarn Irregularity

Though some interest has been shown by the trade in the method for measuring yarn irregularity worked out in T. R. L. and described in T. R. Circular No. 1 it is felt that the subject has not yet received the attention it deserves. Machine makers as well as spinners should find it worth while to adopt the T. R. L. method, giving as it does reliable quantitative information regarding this important character. Through the interest of one of our Committee members the subject has been brought to the notice of one important firm of machine makers and it is hoped to publish a note on the matter in this firm's magazine, which has a wide circulation. It is also hoped that the recently formed Indian Standards Institute, on which the I. C. J. C. is represented, will carefully consider the T. R. L. method for adoption as a standard method.

The Chemistry of the Jute Fibre

In the last report a brief account was given of some conclusions regarding the mode of combination of some of the most important constituents of the fibre. The work has been carried further and papers describing the results have been published in the Journal of the Textile Institute and the Journal of the Society of Dyers and Colourists. The further results support the hypothesis of an ester combination between the polyuronic acids of the hemicelluloses and the lignin of the fibre. Particularly important in this connection is the steady rise in the acid value of the fibre as lignin is progressively removed.

Preliminary work for the study of the viscosity of jute in cuprammonium solution has been taken up.

3. TESTS ON J. A. R. L. SAMPLES.

As a result of partition, Subvention Farm samples have so far been received from only seven centres and no samples from Kishorganj have arrived. Except for one set, the samples received relate to the trials of C 39—212, C 41—13 and C 42—Nj—412 and the Locals. The data are too few for proper comparison of the 1947 crop results but the order of quality at the various centres is given below; here 1 is highest and 4 lowest in quality.

	C 39—212.	C 41—13.	C 42—Nj—412	Locals.
Purnea	2	1	3	1
Maranga (Harda) ..	3	4	1	2
Araria	1	4	3	2
Katihar (Sarifganj) ..	2	3	1	3
Katihar (Daheria) ..	1	3	2	4
Sakhreli	1	3	2	1
Belakoba	4	3	2	1

The C 41—13 seems to have done worse than the Locals but otherwise there is little to be said, though it still appears that C 39—212 is at least as good as the Locals and its higher yield is in its favour. A good deal will depend on the quality of the Locals in relation to D 154.

The other set tested was an Early Varietal Trial.

4. TESTS ON COMMERCIAL FIBRE SAMPLES.

At the time of writing no 1947 crop samples have been received. We have to rely on the co-operation of the trade if this work is to be satisfactorily carried out. Further efforts will be made to secure

suitable samples. The matter is at present receiving attention by the Calcutta Jute Dealers' Association.

A few samples received from the Indian Jute Mills Association, representing jute from N. Bengal, Bihar, Orissa, Assam, etc., were examined and reported on. All except the N. Bengal sample, which was probably overretted, were of good quality. The samples were however too few in number for general conclusions regarding the quality available from these areas.

Through the initiative of Dr. Macmillan it is hoped to arrange for some further trials of samples from West Bengal, Bihar, Orissa, Assam and other areas in the Indian Union.

5. FIBRE CHARACTERS AND SPINNING QUALITY.

It is hoped to complete the remaining work in the present series of tests during the coming year. Thirty samples of white jute and eleven of tossa jute have so far been examined in the fresh series of tests. It is interesting to note that the points obtained by plotting the data for the various physical characters against the quality ratio of T. R. L. standard 10 lb. yarns spun from the samples in most cases obviously lie about different curves for white and tossa jute. Separate prediction equations will be necessary for the two kinds of fibre. In the meantime detailed accounts of the methods employed for determining bulk flexural rigidity, bulk torsional rigidity and the diameter and breaking twist of standard bundles are being prepared for publication.

From seven characters examined in the case of thirty samples of white jute a multiple correlation coefficient of 0.953 against the quality of T. R. L. standard 10 lb. yarn was found. Considering only the ballistic work of rupture of twisted bundles of combed fibre and the torsional rigidity of bundles of fibre the correlation coefficient was 0.943.

It will be of interest to summarise in general terms the position as it now appears. For best spinning quality the raw material should break down in processing to strands which are uniformly of good length and approach as closely as possible to a simple cylindrical form. In practice both these conditions are very imperfectly realised, owing mainly to the meshy or webby structure of the fibre system of

the plant. The breakdown of the meshwork produces branched strands, some even retaining a meshy structure. Breakdown of the meshwork also results in the production of a proportion of strands which are undesirably short and this effect is accentuated if the fibre is weak.

Further, the strands into which the raw material breaks down should be fine, uniform and strong, of low rigidity and as free as possible from adherent tissue. Fineness is very important for a number of reasons. The coarser the strands the greater will be the irregularity of yarns produced under the best possible processing conditions. Lack of uniformity in size and the presence of branches and other irregularities will be reflected in the yarn irregularity. Moreover rigidity may be increased sixteen times if the diameter of the strands is doubled, this character being proportional to the fourth power of the diameter. The importance of torsional rigidity in predicting spinning quality is no doubt largely due to this relation to fineness. An important further point is that the torsional rigidity of strands is likely to closely related to their splittability ; of two strands of the same total cross-sectional area but in one case very compact, and therefore relatively unlikely to be split in processing, and in the other case branched or meshy, and therefore likely to break down in processing, the latter will show a lower torsional rigidity. Adherent tissue (bark, knots, etc.) is inimical to regular drafting. Branches and meshes in the strands also make for irregular drafting.

The characters in the raw material which make for the desirable features referred to above include good lustre, fineness in the reed, mesh-structure as simple as possible, freedom from adherent bark and knots. Jute of good spinning quality also has a high bulk density (feels heavy in the hand). It is worth thorough investigation to see whether long internodes in the plant make for simplicity in the mesh structure and good spinning quality.

The stage of ripeness at harvesting has an important bearing on behaviour in retting and on the quality of the fibre obtained. The general indications are that early harvesting (bud-stage) can be relied on to give good quality provided other conditions are satisfactory. At the flower stage there is evidence that retting is liable to proceed rather rapidly, rendering careful control very necessary ; fibre of good quality is obtainable if retting is satisfactory. At the pod stage overretting may be less liable to occur ; the fibre

may be strong but there is danger of loss of quality, rendering it less suitable for fine yarns. Harvesting at very late stage certainly entails loss of quality.

Fineness in the reed can be secured, *inter alia*,, by ensuring that the crop strand is not too open ; early harvesting also helps but there may be some loss of yield. Although best quality in J. A. R. L. trials was consistently found with a nominal spacing (from sowing rate and germination value) of $4'' \times 4''$ it is known that there was a fairly high mortality and a mature plant spacing of $6'' \times 6''$ is probably not too great for good quality. This would correspond roughly with plants $3''$ apart if sown in lines $12''$ apart. Further work is required on this very important point.

It is suggested that further work in breeding improved varieties should include the following aims :—

(*a*) To breed strains with a high percentage of fibre in each plant.

(*b*) To breed strains with the simplest possible mesh-structure in the fibre system ; long internodes may be one useful index. It will be necessary to study the mesh-structure within the groups of bundles (seen as wedges in cross-sections of the stem) as well as between these groups.

(*c*) To breed strains with fine, uniform fibre-bundles and also with the bundles united in small groups (a group corresponding with the wedge-shaped compound bundles seen in a cross-section of the stem).

It would be difficult to overemphasise the importance of a simple mesh structure in relation to spinning quality. The inferiority, as compared with jute, of various samples of malvaceous and sterculiaceous fibres that have been examined is considered to be largely due to the extreme webbiness of the fibre system, combined with a greater degree of coarseness. In *Urena lobata*, *Hibiscus cannabinus* and *H. sabdariffa*, var. *altissima* the meshiness is moderate, but in *H. moschata*, *Abutilon aviceanae*, *Abroma* spp. and many other similar fibres the meshiness is prominent.

6. GRADING.

We have during the past few years submitted various schemes the approval of the trade and the latest of these is considered to ›resent the limit to which simplification can be usefully carried. ›wever the trade has not felt able to adopt any of the schemes ›posed. In fact opposition was made even to the proposal to nsert into the description of Bottoms the phrase "not acceptable der or capable of inclusion in a mark above." That seems to n up the present attitude of the buyers. There appears to be thing tangible to preclude the buying of fibre of the highest quality Bottoms. We seem to be no nearer to ensuring that the grower given the incentive of being paid in accordance with the quality his fibre in spite of all our efforts.

7. MOISTURE RELATIONSHIPS.

No work has been done under this head during the year. The ıestion of imposing penalties when jute is offered for sale with an ıreasonably high moisture content remains to be taken up by the ›mmittee. It has been suggested from our work that a regain ceeding 20% can normally be avoided even during the moist onths of August to September if proper care is taken.

If difficulties are seen in fixing the limit at this level it would rtainly be reasonable to impose penalties if the regain exceeded %. It should be made clear that this would not imply that any gain below 25% was satisfactory. If 25% regain were adopted, : the present, as the limit for penalties, working of the scheme for year or two could be arranged so as to give information from which would be possible to consider whether the limit should be reduced. suitable organisation with a testing house would be necessary : the working of a scheme for the imposition of penalties. It is ggested that the Committee should take up with the trade the ıestion of setting up a suitable organisation and fixing of the provi›nal limit of regain. Suitable legislative action would have to taken. After a few years working it would be possible to a standard regain limit above which fines would be incurred. :tion in co-operation with the Indian Standards Institute seems sirable.

8. STORAGE OF SUGAR IN JUTE BAGS.

Following up the results obtained in previous work and described in T. R. Memoir No. 11, some fairly large scale trials were started in T. R. L. with sugar stored in bags which had been treated with various chemicals. Behaviour during the coming rainy season will be observed. The necessary supply of sugar arrived too late for us to make use of the 1947 rainy season.

9. BLENDING EXPERIMENTS.

Recently some further work on blending has been taken up, using mixtures of hard and soft jute and of jute and Urena fibre, and the results are awaited.

10. SINGLES AND DOUBLING TWISTS.

A carefully planned set of experiments was carried out to extend the data published in T. R. Pamphlet No. 3. In the earlier work three-ply yarns made from 10 lb. singles with a singles twist factor of 14.7 were examined to see the effect of doubling twist on strength.

In the present series 16 lb. yarns were used in order that a higher singles twist factor could be given on the available machinery. Best strength was obtained in the earlier work when the doubling twist factor was $1.16\ t/\sqrt{n}$, where t is the singles turns per inch and n is the number of plies. In the new series nominal singles twist factors of 14.8 (as near as could be obtained to the value of 14.7 used before) and 18.56 were used and three-ply yarns were made with nominal doubling twists of 2.5 and 3.1 respectively, these being calculated from the formula found from the previous work ($1.16\ t/\sqrt{n}$). The average results given below show very clearly that increasing the singles twist to give the high twist factor of 18.6 has not given better ply-yarn strength.

Singles Twist Factor.	Doubling Twist (t.p.i.) (nominal).	Strength (lb.)
14.8	2.5	51.5
18.6	3.1	44.6

The actual and nominal twists agreed well enough and the results are of some importance. Actually the singles twist factors were slightly less than the nominal factors. There is little room between singles twist factors of 14.8 and 18.6 for a value that might give an optimum strength exceeding the 51.5 lb. found with the former. For example, if a singles twist factor of 16.7 gave a strength of say 54 lb. we should have a drop of nearly 10 lb. in strength in going up to 18.6 twist factor, which is far from likely. It seems reasonable to conclude that for medium yarns a singles twist factor of about 15 is the best we can use when our aim is to get maximum strength in a three-ply yarn and the best advice that can be given at present is to make the doubling twist equal to $1.16\ t/\sqrt{n}$, as above. For three-ply from 16 lb. singles the best twists would be about 3.7 t.p.i singles twist and about 2.5 t.p.i doubling twist if good strength is the aim.

So far only 3-ply yarns have been examined and there is room for much further work. It is anticipated that for heavy yarns a singles twist factor greater than 15 would be required for optimum strength in the ply-yarns and that for fine yarns a rather lower factor would be desirable.

Where resistance to rubbing is very important we may increase the twists and sacrifice some strength ; where good penetration by dyes or sizes is important we may decrease the twists, also at the sacrifice of some strength.

सत्यमेव जयते

11. JUTE COMPETITORS.

Several samples of 'nettle' fibre have been received and reported on during the year.

Samples of linseed flax fibre from Argentina were examined. The quality was low but it is considered that a proportion of such fibre could be spun in admixture with jute for low quality yarns. There is great variety in the quality of linseed flax fibre, but the general low quality is no doubt largely due to the advanced stage of ripeness of the straw, due to growing for seed. It may be possible to remove the bolls at an earlier stage and allow them to after ripen. Climatic conditions in India favour this. But the shortness and branched habit of the plant and general inferiority of the quality of

the fibre (often with large and irregular lumens in the ultimates) are inimical to really good quality. A dual-purpose strain may have better promise.

A sample of "hemp" from the Sudan was reported on. It was of good colour and clean and lustrous but rather coarse and webby.

A note was prepared on the fibres which are considered to be the most important substitutes for jute, namely, *Urena lobata*, *Hibiscus cannabinus* and *H. sabdariffa*, var. *altissima*. True hemp (*Cannabis sativa*) could also be used if the difficulty of the narcotic drug obtainable therefore could be surmounted. Ramie and giant nettle fibres are considered less important substitutes, at least for the present. Sunn hemp (*Crotalaria* spp.) is too coarse to form a satisfactory substitute. Linseed flax fibre may have some possibilities, but the quality is generally low, as noted above. Other *Hibiscus* fibres (*e.g.*, bhendi and musk hemp) tend to be too coarse and meshy, and the same applies to several other malvaceous and sterculiaceous fibres.

12. TREATMENTS OF FIBRE AND YARN.

The study of action of sodium chlorite on jute yarns has been carried a stage further and a paper has been submitted for publication. Although a fairly strong solution is required to produce a good colour and the colour is subject to considerable yellowing unless alkaline treatments are given before or after the chlorite treatment (entailing a high loss in wet strength) there is little doubt that chlorite is one of the most promising bleaching agents for jute. It is to be expected that the price would fall if there were a considerable demand.

Following up the knowledge gained from a study of the hemicelluloses of the jute fibre, a treatment which may have applications in rot-proofing has been studied and the results appear to be of considerable interest. The work continues.

Work has been done to see if treatments which may be expected to form cross-linkages between the molecular chains in the fibre produced an increase in strength. One experiment, with a rather strong solution of the chemical used, at least indicated that the loss in strength produced by caustic soda treatment was reduced. Further work with weaker solutions and other treatments is being done.

Experiments on the flexibility, compressibility and resilience of jute ply yarns treated with caustic soda solutions of various strengths were carried out. When the yarn was allowed to shrink, greater increases in both compressibility and resilience were found with 5% caustic soda (room-temperature) than with 1% or 10% solutions.

In a triplicate test it was found that a solvent-extracted yarn lost less strength on exposure to light than the ordinary yarn as spun. From experience in other connections it may be suggested that the oxidation during exposure of the substances (including batching oil) removed by the solvent accelerates the oxidation of the fibre, though other factors may also be involved. Some work on the effect of copper, applied in two different ways, on the loss in strength of yarns on exposure has also been carried out.

14. NEW OR EXTENDED USES.

A supply of 3 lb. tossa jute weft has been spun and the necessary two-ply cotton warps obtained for some further trials in the weaving of a jute-cotton union and this work will be taken up shortly. Meanwhile further close attention has been given to the subject. Important points in making such unions, intended for clothing, are (*a*) to give little or no bleaching or other chemical treatment to the jute weft, since an undesirable reduction in wet strength is so difficult to avoid and (*b*) to choose a cloth structure which hides the jute weft as well as possible, but at the same time we must see that we embody enough jute in the cloth to lower the cost sufficiently in comparison with all-cotton cloth. When the price of jute is very high there is very little margin. Such a union was recently offered at Rs. 10 per yard, 54 in. wide. Common structures used for the unions approximate to the following :—

Two ply cotton warp	..	2/32's to 2/36's (grey counts)
Jute weft ,,	..	3 lb.
Ends per inch	..	68 to 74
Picks per inch	..	34 to 44

The closer structures are rather stiff for clothing and a weight not exceeding 10 oz. per square yard seems desirable, which means about 34 to 36 picks of 3 lb. jute per weft according to the warp used. As woven, the cloth is very hairy with projecting jute strands and cropping and singeing are desirable.

The warp may be bleached, or mercerised and bleached. The weft is best woven as spun and a light treatment given to the cloth, after singeing, to remove batching oil, weaving stains and singeing dirt, and make the cloth ready for finishing. A fair proportion of fatty oil may be used in the batching mixture for the jute weft in order to facilitate removal. A soft finish is of course desirable and one of the several softening agents now available may be added. Final treatment may well be sanforising or a similar shrinking process.

The main work bearing on this subject is that outlined under Section 12, above.

Reports on samples of dyed ply-yarn for knitting trials sent to two enquirers have not yet been received in spite of reminders. A note on the economics of the production of fine jute yarns has been submitted separately.

GENERAL.

Staff

Mr. A. S. Gillies, who has held the position of Manager since April, 1939, found it necessary to apply for leave as from May 1st. 1948 preparatory to terminating his services with the Committee because of ill health. Mr. Gillies has done excellent work during his ten years of service and shown his ability both in research problems and in various engineering and other problems that have constantly arisen. His departure will be a great loss and it may be difficult to find some one equally suitable for the post.

Dr. P. B. Sarkar, officiated as Director during the latter's absence on leave from June to November.

Mr. A. Krishnan resigned his post as Librarian during the year and Mr. P. R. Mukherjee, B.Sc., (Hons.) Senior Tester, ably carried out the duties for a time pending the appointment of Mr. A. K. Sur.

Three Junior Testers were appointed during the year to fill vacancies.

A list of the staff is appended to the report.

Visitors

Among visitors to the Laboratories during the year mention may be made of the following :—

Sardar Bahadur Sir Datar Singh		Vice-President, I.C.A.R., President I.C.J.C.
Rai Bahadur R. L. Sethi	..	Agricultural Commissioner with the Government of India.
Mr. James Scott ..	..	Messrs. J. F. Low & Co., Ltd.
Mr. John Page ..	..	Messrs. Fairbairn Lawson Combe Barbour.

Museum

The exhibits provided include a representative collection of hessians, sackings and other cloths, including paper-packed cloth and other combined materials. A number of wall charts, diagrams and photographs illustrate important aspects of jute research and technology. A collection jute substitutes or competitors is exhibited. Two show-cases contain T. R. L. exhibits bearing on new uses for jute and other aspects of the work. The preparation of further exhibits is in hand.

Summary

The usual tabular summary is appended.

(*Sd.*) C. R. NODDER.

APPENDIX

Subject.	Progress.	Future Work.
1. Spinning Technique ..	(*a*) We are now very well-equipped with suitable methods for spinning small samples. (*b*) No work has been done during the year on subjects such as the effect of variations of drafts and doublings and other processing variations on yarn quality.	(*a*) Minor variations may be found necessary for special needs ; otherwise improvements will depend on new ideas, making for greater perfection or enabling still smaller quantities to be dealt with. (*b*) An examination of the effects of variation in batching emulsions on spinning performance and yarn quality is in view. Other studies of the effects of processing variations may be taken up as opportunity permits.
2. Background Research ..	(*a*) Arrangements necessary for the study of the tensile strength of twisted bundles of fibre have been made, involving the design of special attachments to the ply-yarn strength tester.	(*a*) Tests with the apparatus may be continued.

	(*b*) The coefficient of friction between pads of jute fibre has been studied, using an inclined plane apparatus. There are some signs of a relation between coefficient of friction so determined and yarn irregularity.	(*b*) A study of the relation between coefficient of friction of pads of batched fibre and yarn irregularity, etc., may be made. The usefulness of the second method referred to may be further examined.
	(*c*) Fibre hardness. Some experiments, using a compression apparatus for single strands, have been carried out. No clear relationship with spinning quality has been found as yet.	(*c*) Further work may be done with a slightly modified apparatus
	(*d*) Preliminary work has been done on the 'creep' properties and torsional rigidity of single strands.	(*d*) Work on single strands presents many difficulties in the case of jute and bundle tests are generally quicker and perhaps more useful. Work on the creep and other elastic properties of yarns may be done, as done, as geometric considerations may overshadow inherent creep properties
	(*e*) Data relating to the extensibility of jute yarns have been studied. Extension at break is of the order of two per cent, and this agrees with the low breaking extension of the fibre strands, which	(*e*) Further tests, linked up with these under (*d*) may be made.

Subject.	Progress.	Future Work.
	is of a similar order. Variations in twist afford a ready means of adjusting extensibility, within limits. (*f*) Yarn diameters. Several methods for estimating yarn diameter have been examined and the results compared. A method depending on the measurement of the length of a thread (or wire) wound on to a cylinder, with and without lengths of yarn arranged on the surface (parallel to the cylinder axis), promises to be useful, particularly when yarn diameters are required for cloth calculations.	
	(*g*) The chemistry of the jute fibre. Further work has been done, particularly on the role of hemicelluloses, and several papers have been published.	(*g*) The work, which is of fundamental importance and has practical bearings on bleaching, dyeing and finishing may continue. It is hoped to study the viscosity of jute in cuprammonium solution with a view to seeing if relations to

		strength and other characters can be detected.
3. Tests on J. A. R. L. Samples.	The spinning and testing of the remaining 1946 crop samples was completed. As a result of partition, samples of the 1947 crop have so far been received from seven centres only. These represented further trials of C 39—212, C 42 Nj—412 and C 41—13 and some trials of early varieties. All have been spun and reported upon. C 39—212 still appears to be as good in quality as the Locals and is said to yield better than D 154. Much may depend on the comparison of D 154 and the Locals (in cases when the latter is not D 154).	This important work must continue as required by J.A.R.L.
4. Commercial Fibre Samples	No supply of the 1947 crop samples has yet been received but efforts are being continued to secure them.	Co-operation of the trade is essential for the supply of samples that will be of interest. Contact with the Calcutta Jute Dealers Association and I.J.M.A.R.I. is being maintained on this subject.
5. Fibre Characters and Spinning Quality.	Routine work has continued and the results are valuable. A multiple correlation coefficient of 0.953	This present series of tests may continue as it was not

Subject.	Progress.	Future Work.
	against spinning quality was found, using seven fibre characters. Considering only the ballistic work of rupture and torsional rigidity of standard bundles of fibre the coefficient was still as high as 0.943. Torsional rigidity is important because of its close relation to fineness. The torsional rigidity of bundles of fibre is likely to be largely influenced by splittability, which is most important for spinning quality. The further work emphasises the importance of fineness and the difficulties arising from the meshy structure of the jute fibre system.	completed by March, 1948, as hoped. Attention to the nature of of the fibre meshwork by the plant breeder seems important. It may be suggested that long internodes in the plant may be associated with a comparatively simple mesh-structure, which is a *desideratum.*
6. Grading	There are no new developments	The trade is adverse even to the insertion of the phrase "not acceptable under or capable of inclusion in a mark above" into the description of bottoms. In view of this it is difficult to see how progress can be made.

7. Moisture Relationships ..	No work on this subject was done during the year.	The imposition of penalties when jute is offered for sale with a regain exceeding an amount to be specified is suggested. Legislation will be necessary and working of the scheme would enable adjustments of the permissible regain level to be made.
8. Storage of Sugar in Jute Bags.	A fresh series of tests is in progress. Results will be available after the 1948 rainy season.	Further work is necessary.
9. Blending Experiments ..	Recently some experiments on (*a*) blending hard and soft jute and (*b*) blending jute with Urena fibre were made. The results of yarn tests are awaited.	Work may continue.
10. Singles and Doubling Twists.	Further work indicates that a singles twist factor in the neighbourhood of about 15 need not be exceeded for maximum strength in the ply-yarn, but this must be regarded as provisional and, in any case, three-ply yarns only have so far been studied. The results reported for 3-ply yarn made from 16 lb. singles are, however, rather striking.	There is much more work to be done and it may be fitted in as opportunity permits.

Subject.	Progress.	Future Work.
11. Jute Competitors ..	A number of further samples have been tested ..	The work seems to be of increased importance pending the assurance of an adequate supply of jute to Calcutta mills and should continue.
12. Special Treatments of Fibre and Yarn.	A good deal of work has been done that bears on new or extended uses for jute, covering chlorite bleaches, the action of caustic soda solution on jute yarns, the behaviour of jute yarns on exposure and attempts to improve yarn strength.	Better facilities for such work will be available shortly in the new chemical technology laboratory.
14. New or Extended Uses ..	Commercial samples of jute-cotton unions have been examined and in the report important matters concerning the production of such materials for clothing are discussed. A note has been prepared on the probable cost of production of jute ply-yarns suitable for knitting. There appears to be a large margin when the cost of wool knitting yarns is compared.	Cotton warps and 3 lb. jute weft spun in T. R. L. is ready for weaving into further experimental cloths and this will be taken up shortly. It is hoped to take up the question of using wool in combination with jute.

15. *Ad hoc* Investigations ..	A small number of fibre and yarn samples sent for testing have been reported on.	It is proposed to carry out yarn irregularity tests on further commercial samples from Calcutta mills, particularly sacking weft yarns.
16. Collection of Information	Back numbers of some important journals have been acquired for the Library.	.....

STAFF OF TECHNOLOGICAL RESEARCH LABORATORIES.

Director	Mr. C. R. Nodder, O.B.E., M.A. (Cantab.).
Manager	Mr. A. S. Gillies, A.T.I., F.R.S.A.
Senior Research Physicist	Dr. K. R. Sen, D.Sc. (Dacca).
Senior Research Chemist	Dr. P. B. Sarkar, D.Sc. (Dacca).
Junior Research Assistant (Physicist) ..	Mr. B. K. Chakrabarti, M.Sc.
Junior Research Assistant (Chemist) ..	Mr. H. Chatterjee, M.Sc., A.I.C.
Head Tester ..	Mr. S. B. Bandopadhyay, M.Sc.
Senior Tester ..	Mr. S. R. Guha, B.Sc.
,, ...	Mr. P. R. Mukherjee, B.Sc. (Hons.).
,, ...	Mr. A. K. Mazumdar, B.Sc. (Hons.).
Junior Tester ..	Mr. S. K. Bose, B.Sc.
,, ...	Mr. U. Chatterjee, B.Sc.
,, ...	Mr. K. B. Pal, B.Sc.
,, ...	Mr. S. R. Das, B.Sc.
,, ...	Mr. H. Ghosh, B.Sc.
,, ...	Mr. S. K. Guha, B.Sc.
,, ...	Mr. B. K. Bose, B.Sc.
,, ...	Mr. M. M. Das Gupta, B.Sc.
,, ...	Mr. P. N. Mazumdar.
Statistical Clerk ..	Mr. S. K. Mukhopadhyay, B.Sc.
Electrician	Mr. R. K. Bhattacherjee.
Librarian	Mr. A. K. Sur, M.Sc.
Head Clerk	Mr. T. C. Chakraburtty.

ANNUAL REPORT ON THE PROGRESS OF THE MARKETING SCHEMES FOR THE YEAR 1947-1948

The Indian Central Jute Committee while considering the half-yearly progress report and the Annual Programme of the Marketing Section for the year 1947-48 at its 21st Meeting held in January, 1947, decided as follows :—

" (1) That the two experimental Co-operative Jute Sale Societies undertaken by the Committee should be abolished ;

" (2) that the three Grading Parties of the Committee now working in Bengal, should cease to function and the Government of Bengal should be requested to take them over ;

" (3) that the Committee should continue to disseminate, as at present, the Calcutta Loose Jute Prices to the centres in Bihar, Assam and Orissa for another year ;

" (4) that the scheme of marketing of fibre grown from improved seeds should be discontinued ;

" (5) that the scheme for the study of Indian market with a view to increase the consumption of jute and jute goods should be taken over by the Economic Research Section ;

" (6) that there was no necessity for continuing the work on the organisation of collective sales and co-operative transport in the Sarisabari area as the Society working there had already been disbanded ;

" (7) that the two Co-operative Societies of cottage workers in jute spinning and weaving should continue for the remaining sanctioned period of the scheme ;

" (8) that the scheme of collection of jute prices and other statistics from *mofussil* areas in Bengal should be transferred to the Economic Research Section ; and

(9) that the work under item "Miscellaneous" should be carried on by the Marketing Section subject to the modifications in the above recommendations."

2. Accordingly, during the period under report, the Marketing Section was left with the following items of work on its programme :—

I. Experimental Co-operative Societies of Cottage workers in jute spinning and weaving in Bengal,

II. Dissemination of Calcutta Loose Jute Prices to selected centres of Bihar, Assam and Orissa,

III Collection of jute prices from Sarisabari, Akhaura and Jalpaiguri for publication in the Committee's *Bulletin*,

IV. Publication of Monthly Review of Indian jute markets in the *Bulletin*,

V. Collection of jute prices from Bihar, Assam and Orissa for publication in the *Bulletin*, and

VI. *Ad hoc* and trade enquiries.

3. As regards the Jute Grading Scheme in Bihar and Assam and the Experimental Co-operative Marketing Scheme in Orissa which were conducted directly under the supervision of the Provincial Governments concerned, the Indian Central Jute Committee agreed that they should continue to function during the year as before.

4. Later on, the following two items of work were also added to the programme :—

(*i*) Preparation of Weekly Raw Jute market report for submission to the Economics and Statistical Adviser to the Ministry of Agriculture, India, and,

(*ii*) Communication of raw jute prices to the above officer on every Saturday by telegram.

5. The Marketing Section existed as such up to the third week of December 1947 and during this period Mr. S. M. Gupta,

Offg. Marketing Officer held charge of the same. Afterwards, the Section was amalgamated with the Economic Research Section and placed under the charge of the Director of Economic Research in pursuance of the decision of the Committee at its 22nd meeting held in December, 1947.

6. A brief summary of the work done during the year under review is given below :

CO-OPERATIVE SOCIETIES OF COTTAGE WORKERS IN JUTE SPINNING AND WEAVING IN BENGAL

Since our last report, 12 members were enrolled to the Domar Society while only 8 were enrolled to its counterpart at Setabganj. The slow progress may, however, be attributed to the uncertainty of their future working after the partition of Bengal. A statement showing their final position is given below :—

	Members actually enrolled.	Share money collected.	Admission fees collected.
		Rs. a. p.	Rs. a. p.
Domar Society ..	343	459 0 0	172 0 0
Setabganj Society ..	268	273 0 0	134 0 0

7. In order to facilitate purchase of 'hessian strips,' several collection centres were selected in advance in both the areas in consultation with the Honorary Secretary and Manager of the respective societies. Besides, a rough estimate of the expected turnover of business during the year was prepared and necessary propaganda made for their production.

8. As a result of the Offg. Marketing Officer's visit to certain consumer's markets for 'hessian strips,' a few enquiries were received from Indore and Akola. One of the firms however intimated their desire to buy 2000 maunds of 'hessian strips' provided the terms were attractive to them while our estimated purchase was only 1200 maunds during the year.

9. Prior to the commencement of the season, the Government of Bengal were approached by the two societies with the request to make the working funds of Rs. 5,000 available to each of them as agreed to before. But in the meanwhile, the previous arrangement for finance was upset owing to the announcement regarding partition of Bengal according to which both the societies fell within Eastern Pakistan. Therefore, with a view to discussing the future working of these societies, the Committee's Secretary called a meeting at Jalpaiguri towards the end of September 1947 in which the Registrar of Co-operative Societies and Director of Industries, East Bengal were invited to attend. Although none of these officers attended the meeting, it was made clear to those present that the Indian Central Jute Committee will be reluctantly compelled to withdraw its financial and other support from them if they were not able to arrange for the working capital. The societies therefore made frantic efforts to obtain necessary working funds from the following sources :—

(*i*) East Bengal Government,
(*ii*) Central Co-operative Banks, and
(*iii*) Members of Societies.

But, as they failed to receive favourable response from any quarter, and as the Government of India intimated that they were not in favour of carrying out any work outside their territorial limits, the Committee's financial and other supports were withdrawn from them on the 31st December 1947 in pursuance of the decision of the Indian Central Jute Committee arrived at its meeting held earlier in December, 1947.

DISSEMINATION OF CALCUTTA LOOSE JUTE PRICES

10. As before, Calcutta Loose Jute prices were sent out daily through the Publicity Section of the Committee to some centres in Assam, Bihar and Orissa. The prices were collected from two local brokers' firms and were communicated by ordinary post to the local officers of the Provincial Government who were responsible for

proper dissemination of the same among growers and others. The number of centres that were served is shown below :—

Assam ..	..	21
Bihar ..	..	9
Orissa ..	..	4
Total	..	34

11. It may, however, be recalled that the Indian Central Jute Committee at its meeting held in December, 1947, decided that, " (*i*) the service should continue till the end of March, 1948. In the meantime, the Provincial Governments should be asked to inform the Committee if they wanted the continuance of the service, and that if they did, (*ii*) the variations in price should be communicated to the different Provincial Governments by telegram in order to keep them informed of the latest Calcutta prices." Accordingly, the Provincial Governments were written to on the matter when in reply they requested the Committee to send them the information as it was serving useful purpose. The service was however continued in the old form till the end of March, 1948 in accordance with the above decision of the Committee.

COLLECTION OF JUTE PRICES FROM SELECTED CENTRES OF BENGAL

12. As in previous year, baler's prices, that is, prices at which balers either purchased or were willing to purchase unassorted and unpacked jute were collected on daily basis through the District Agricultural staff posted at Sarisabari (Mymensingh), Akhaura (Tippera) and Jalpaiguri. On tabulation of the same, it was published in the Committee's *Bulletin*. Consequent on the partition of Bengal, however, collection of this information from Sarisabari and Akhaura, both of which fell within East Pakistan, was discontinued.

PUBLICATION OF MONTHLY REVIEW OF INDIAN JUTE MARKETS IN THE BULLETIN

13. As before, preparation and publication in the Committee's Bulletin of a Monthly Review of the Indian Jute Markets formed a regular feature of the routine work of the Section during the period under report.

COLLECTION OF JUTE PRICES FROM BIHAR, ASSAM AND ORISSA

14. As in the case of Bengal, baler's prices were also collected from Gulabbagh (Bihar), Kendupatna, Danpur and Marshaghai (Orissa) during the year under review. While the information from Gulabbagh was collected through the Jute Overseer, Purnea, the information from the Orissa centres were collected through the Supervisors of the Jute Sale Societies. Although prices from Haibergaon market (Assam) were received during the previous year, no information could be collected during the year under review as the local staff of the Provincial Marketing Department was disbanded earlier. The information received from Bihar and Orissa was, however, tabulated and published in the *Bulletin*.

AD HOC AND TRADE ENQUIRIES

15. Information relating to the number of *pucca* baling presses and the cost of preparing *pucca* bales was collected and furnished to the Ministry of Commerce, Government of India. Several enquiries regarding jute prices, trend of markets and distribution of export quota for raw jute and jute goods were received from various sources and were disposed of during the year under review.

MISCELLANEOUS

16. As their provincial Marketing Department was abolished, the Government of Assam did not implement the Jute Grading Scheme during the year, although the Indian Central Jute Committee had sanctioned it. As regards the Grading Scheme in Bihar, the work commenced towards the end of September and the Grading Party covered four areas, namely, Purnea, Katihar, Forbesganj and Kishenganj during its 4 months' operation. The Offg. Marketing Officer visited Bihar in November 1947 and inspected the work of the Grading Party. It will be seen from the report submitted by the Director of Agriculture, Bihar, that the work during the period was satisfactory.

17. A separate report on the working of the Jute Sale Societies and Village Jute Grading in Orissa as submitted by the Provincial Co-operative Department is for consideration of the Indian Central

Jute Committee, from which it will appear that the scheme recorded satisfactory progress. It may however be mentioned that information regarding the Calcutta market trend was supplied to the Senior Marketing Officer, Orissa, in this connection from time to time.

18. Pursuant to the request made by the Economics and Statistical Adviser, Department of Agriculture, Government of India, Weekly Raw Jute Market report was prepared and forwarded to him from September onwards. Besides, Saturday prices for raw jute were communicated to the above officer by telegram from February last.

ACKNOWLEDGMENTS

19. The Marketing Section is indebted to Messrs. J. Thomas & Co., Ltd. (Jute and Gunnies), Landale and Clark, Ltd., R. Sim & Co., H. D. Cartwright & Co. and B. Adhikary & Co. for kindly supplying market quotations and reports. Gratitude to various officials of the Provincial Governments concerned is also expressed for the kind help received from them in connection with execution of necessary work. The staff was loyal to the Section and worked hard in spite of many difficulties.

K. C. BASAK
Offg. Director of Economic Research

APPENDIX

Programme of work for 1947-48	Progress made	Future work
1. Experimental Co-operative Societies of Cottage Workers in Jute spinning and weaving in Bengal.	Some members were enrolled and propaganda made for the production of 'hessian strips.' Necessary arrangements for assembling of the same were also made. Several enquiries were received from consumers for the supply of these goods ; but consequent on the division of India both the Societies fell within Eastern Pakistan thus upsetting the arrangements for advancing of capital arrived at earlier. The Societies, therefore, tried to secure financial aid from other quarters but without success. Consequently, the Indian Central Jute Committee withdrew its financial and other supports from these Societies on the 31st December, 1947, in pursuance of the decision of the Indian Central Jute Committee.	
2. Dissemination of Calcutta Loose Jute Prices to	Price cards were sent daily to 34 centres located in Assam, Bihar and Orissa. Giving publicity to	As the Provincial Govts. desired that the price infor-

selected centres in Bihar, Assam and Orissa.	the information at the other end was however the responsibility of the Provincial Governments.	mation should be sent, variations in price should be communicated to different Provincial Governments by telegram in order to keep them informed of the latest Calcutta prices as decided upon by the Indian Central Jute Committee.
3. Collection of Jute Prices from selected centres of Bengal.	Baler's daily purchase prices or prices at which they were willing to purchase unassorted and unpacked jute were collected through the District Agrl. staff posted at Sarisabari, Akhaura and Jalpaiguri. They were then tabulated and published in the *Bulletin*. Collection of the information from Sarisabari and Akhaura was however discontinued after partition as both of them fell in Eastern Pakistan.	Collection of the information will be made from Dankuni and Jalpaiguri (West Bengal) through Investigators.
4. Publication of Monthly Review of Indian Jute Markets in the *Bulletin*.	The review was regularly published. ..	This is to be continued.
5. Collection of Jute Prices from Bihar, Assam and Orissa.	Baler's prices were collected from Gulabbagh (Bihar), Danpur, Kendupatna and Marshaghai (Orissa). The information could not be collected from Haibergaon (Assam) for want of suitable local staff.	The information is to be collected from Gulabbagh (Bihar), Danpur (Orissa) and Rupahi (Assam) through Investigators.

APPENDIX

Programme of work for 1947-48	Progress made	Future work
6. *Ad hoc* and trade enquiries	Information relating to the number of Pucca baling presses and the cost of preparing pucca bales was collected and furnished to the Ministry of Commerce, Government of India. Several enquiries regarding jute prices, trend of markets and distribution of export quota for raw jute and jute goods were attended to.	This item of work is to remain.
7. Miscellaneous ..	(*i*) An inspection of the work of the Gulabbagh Jute Grading Party was carried out. (*ii*) Necessary advice was given to the Jute Sale Societies of Orissa regarding their business transactions whenever they approached for the same. (*iii*) Weekly Raw Jute Market Report was prepared and submitted to the Economics and Statistical Adviser, Department of Agriculture, Government of India as also Saturday prices for raw jute were communicated to him.	No work in connection with (*i*) and (*ii*) as both the schemes have been dropped out. Submission of weekly market report and raw jute prices is to continue.

ANNUAL REPORT OF THE ECONOMIC RESEARCH SECTION FOR THE YEAR 1947-48.

During the year under review, Mr. D. Ghosh, Director of Economic Research, was in charge of the Economic Research Section up to the 29th August, 1947, after which he left the Committee's services to take up an appointment under the United Nations. Mr. K. C. Basak, Statistical Officer, took over charge of the Section as the Officiating Director of Economic Research in addition to his own duties, and was the head of the Section for the rest of the period under review. In December, 1947, the Committee decided to amalgamate the Marketing Section of the Committee with the Economic Research Section and as such the former was put under the charge of the Officiating Director of Economic Research. It may be noted that the Officiating Director was the only Officer in the Section for the major part of the period under review and as such had to shoulder heavy duties and responsibilities at a most critical period in the history of the jute industry of this country.

Besides carrying out the programme of work approved by the Committee for the year 1947-48, the Officiating Director had to devote considerable time and energy in investigating complex problems of the jute industry arising out of the division of India. In this connection he had to deal with several vital questions of policy regarding the jute industry referred to the Committee by the Government of India, and a series of notes dealing with these problems were prepared by him. He had also to attend a number of conferences called by the Governments of India and West Bengal to give expert opinion on problems of jute.

The Section had to work under considerable difficulty on account of shortage of staff and communal disturbances both in Calcutta and in Mofussil areas. Several important posts fell vacant owing to the resignation of the permanent incumbents, and they could not be filled up in time on account of the stand-still order issued by the Government of India sometime before the actual transfer of power. One of the most important investigations, *viz.*, the investigation into the economics of jute growing, which involved field study for one complete agricultural year in the five centres selected in East Bengal, had to be stopped in December, 1947, following the decision of the Government of India to the effect that the Committee should

not carry out any investigation outside the Dominion of India. In spite of these difficulties, the work put through during the year under review was quite satisfactory.

The Committee at its meeting held in January, 1947, approved the following programme of work for the Economic Research Section :—

(1) Investigation into the Economics of Jute Growing,
(2) Study of Mofussil Prices of jute and other statistics,
(3) Study of the Indian Markets for jute goods,
(4) Statistical Analysis of data on the Physiology of Jute,
(5) Study of secular, cyclical and seasonal variations of important jute statistics,
(6) Study of the British Market for jute and jute goods.

The Committee, however, directed at its meeting held in December, 1947, that items (5) and (6) should not be taken up.

A ummary of the work done during the period under review is given below.

INVESTIGATION INTO THE ECONOMICS OF JUTE GROWING

This was the third year of the investigation which began in 1945. In the first two years the investigation was carried out in three centres in East Bengal, *viz.*, Dacca, Rangpur and Jessore. According to the decision of the Committee, two more centres were opened early in 1947, one in the Mymensing District and the other in the Faridpur District. In order to make the enquiry more representative than in the first two years, the number of farms selected at each of the five centres was raised from 20 to 50. The technique of selection was also improved by adopting the method of stratified sampling. The investigators were instructed to record field operations plot by plot. Records of about 2,000 plots were thus obtained by our investigators. In order to cope with the increased volume of work, the field staff at each centre was augmented by the addition of two junior investigators who worked under a senior investigator.

One of the senior investigators resigned his post early in the season and new appointments could not be made to fill up this vacancy and another post of senior investigator for a new centre on account of the stand-still order issued by the Government of India. Two of the five centres were, therefore, managed by junior investigators which naturally handicapped our work. Communal disturbance and suspicion among growers in the mofussil areas, particularly after the transfer of power and the division of the country, seriously interfered with the smooth working of the scheme. Moreover, as already noted, all the five centres in East Bengal had to be wound up before investigation for the year could be completed. It must be said to the credit of the field staff that they struggled hard against heavy odds to make the enquiry as much of a success as was possible under the prevailing circumstances.

The enquiry relating to the jute crop was fairly complete, but those for paddy and winter crops had to be cut short as the centres were closed down for reasons explained above. A comprehensive report on the investigation for the year 1947 will be placed before the Committee at its meeting to be held in July, 1948.

The report for 1946, *i.e.*, the second year of the investigation, was prepared in the first quarter of the period under review. It was, however, considered by the Committee at its meeting held in December, 1947, as the usual July meeting was postponed. Besides the usual estimates of cost of production of jute and paddy, two other special features of this report are noteworthy. The reliability of the estimates was examined statistically and was found to be moderately satisfactory. It was, however, suggested in the report that to improve the reliability larger samples should be taken at each centre. This was done in 1947, and statistical analysis has revealed definite improvement in the estimates. Another feature of the 1946 report was that a method was suggested for forecasting the cost of production of jute on the basis of data relating to the pre-harvesting operations. It is to be noted, however, that the method proposed was a tentative one and that it could be justified and recommended for adoption only after data accumulated from actual investigation over a number of years had supported the hypotheses underlying the method and proved its efficiency beyond any doubt.

After considering this report, the Committee decided that the investigation should be continued in five new centres to be opened in the Indian Dominion in consultation with the Provincial Govern-

ments concerned, of which two should be in West Bengal and one each in Bihar, Orissa and Assam. On the suggestion of the Governments of West Bengal, Bihar, Orissa and Assam, steps were taken to select centres for the investigation at the following places :—

West Bengal	..	(1) Jalpaiguri.
		(2) Hooghly or 24-parganas.
Bihar	..	(3) Purnea.
Orissa	..	(4) Kendrapara.
Assam	..	(5) Nowgan.

Considerable difficulty was experienced in securing accommodation for the field staff and their office, as the housing problem in mofussil areas was found to be just as acute as in big towns. This somewhat delayed the selection of centres. After a good deal of trouble some accommodation has been provided for the staff at each centre, but it is far from satisfactory at least in some centres. The centres finally selected are :—

West Bengal	..	(1) Belakoba (Jalpaiguri).
		(2) Monoharpur (Hooghly).
Bihar	..	(3) Purnea.
Orissa	..	(4) Kendrapara.
Assam	..	(5) Rupohi (Nowgan).

As before, each centre has been put under the charge of one Senior Investigator who will be assisted by two Junior Investigators. The Local Sub-Committee has also sanctioned the post of a Supervisor temporarily for one year, whose duty will be to supervise the work of the field staff in order to improve the quality of their work.

Unlike the farms in East Bengal, the jute growing farms in the new centres are widely scattered, and consequently the investigators have to spend a good bit of their time in moving from one farm to another for collecting data. Besides, the investigators

will have to devote some time for collecting price and other statistics in connection with another scheme for the study of mofussil prices of jute. The number of farms to be investigated at each centre has, therefore, been reduced from 50 to 40. Farms have been selected by the method of stratified sampling.

STUDY OF MOFUSSIL PRICES OF JUTE AND OTHER STATISTICS

The work on this scheme was started in October, 1945, by the Marketing Section of the Committee. Following a decision of the Committee, the scheme along with the staff was taken over by the Economic Research Section from April, 1947. A report was drawn up on the work carried out in 1946 at Sarisabari.

The enquiry was undertaken with a view to throwing light on the relation that existed between jute prices in secondary markets and villages within the "pull" of these markets. The analysis of the data led to the following findings and conclusions :—

1. Both village prices and secondary market prices fluctuate fairly widely from month to month and over shorter periods.

2. The fluctuations of village prices are, however, wider than those of the secondary market prices.

3. Some part of the relatively larger undulation of village prices is due to the deterioration of the grade composition of the jute sold at the villages with the progress of the season.

4. It is not, however, possible to say to what extent this phenomenon is due to a real deterioration of raw jute as a result of storage under farmer's conditions or to an upward revision of the grading standard by balers after they have secured the major part of their year's requirements. The former hypothesis may be the subject of fruitful technological research. The latter can be examined by means of an intensive temporal study of grading at a selected centre.

5. Contrary to expectation, the margin between the prices at villages and secondary markets was found to be negligible and often negative. This fact would seem to suggest that the small-scale middleman, who constitutes the link between the primary and secondary markets, makes his profits from an under-grading of the grower's jute rather than from a difference between his buying and selling prices.

6. Any movement of the price of the fibre at the terminal market tends to be magnified as it is transmitted to the secondary market and still more as it reaches the village market. Obversely, any measure of stabilisation of terminal market prices would reduce more than proportionately the instability of village prices.

7. During the period of the study, village prices and secondary market prices moved within a short distance of Calcutta prices in the area investigated.

The Committee considered the report on this enquiry at its meeting held in December, 1947, and decided that the scheme should be continued for one year from July, 1948. The work on the scheme will be carried out at the five centres selected for the investigation into the economics of jute growing, which will afford a much wider scope for the enquiry than before.

STUDY OF THE INDIAN MARKET FOR JUTE GOODS

The Committee at its meeting held in January, 1947, asked the Director of Economic Research to prepare a note and a plan of work for an extensive investigation into the market for jute goods in India. In this note it has been shown that Bengal, which is the largest producer of jute goods, is also the biggest consumer. Several other provinces in the Indian Dominion, such as Bombay, Madras and United Provinces, consume jute goods in important quantities and there are very few areas in which jute goods are not consumed in significant quantities. Trade statistics also show that the most important type of jute manufacture consumed in India is sacking bag which accounts for 59% of the total consumption, and next in importance is hessian cloth, its share being 19% of the total.

The Committee at its meeting in December, 1947, considered the note submitted by the Director of Economic Research and accepted his scheme for the investigation which would last for two years. Work on the scheme will begin as soon as necessary sanction for it is received from the Government of India.

STATISTICAL ANALYSIS OF DATA ON PHYSIOLOGY OF JUTE

Prof. J. C. Sen Gupta carried out a number of experiments in 1945-46 to study the physiology of jute. The statistical analysis of his data was done in the Economic Research Section and an interim report of the analysis was considered by the Committee at its meeting held in December, 1947. The main conclusions drawn in this report are summarised below :—

(1) The entire analysis of the time of sowing experiments stresses the importance of environmental factors, particularly at the time of sowing. Although the best growth-promoting factors are to be found during the rainy season, the jute plant can take the fullest advantage of them if it is sown at the right time which turns out to be the month of April. The time of sowing of the plant normally determines its growth, longevity and reproductive power.

(2) As regards the effect of three nutrient solutions—Hogland's, Knop's and Richard's—on the height of the jute plant, the nutrients gave no better result than the control. This conclusion, however, is subject to further verification on account of the small number of plants in the control group. As between the nutrients themselves, Hogland's solution is perhaps the best and Richard's solution is definitely the worst. The behaviour of Knop's solution is somewhat different for the two types of jute. It is on the whole as good as Hogland's solution for Capsularis but inferior to the latter for Olitorious.

The results of the statistical analysis for other experiments will be submitted at the next July meeting of the Committee.

The Committee at its last meeting further directed that the experimental data for 1946-47 should also be analysed statistically by the Economic Research Section. Preliminary work in this connection is under progress.

PROBLEMS OF JUTE INDUSTRY ARISING OUT OF THE PARTITION OF BENGAL

The partition of Bengal has given rise to many problems vitally affecting the jute industry of this country. Most of these problems were referred to the Committee by the Government of India for expert opinion on them. Mr. D. Ghosh, the late Director of Economic Research, prepared the following notes in this connection before he left the Committee's services :—

1. The main issues relating to jute raised by the division of India.

2. The effect of partition on economic research in jute.

From June 1947 onwards, much of the time of the Officiating Director was also taken up in investigating these problems. A list of notes prepared by him in this connection is given below :—

1. Problems of jute industry after Bengal partition,

2. Probable jute position after division of India,

3. Estimate of area and output of jute in India and Pakistan,

4. Revised estimate of area and output of jute in India and Pakistan,

5. Note on the estimates of acreage and output of jute in 1946-47 furnished by the Government of West Bengal,

6. Jute position in 1947-48.

7. Note on the recommendations regarding the exports of raw jute,

8. Jute industry and the problem of raw jute supply,

9. Sharing of jute export duty between Pakistan and Indian Union,

10. Notes on enquiries from the Government of India, Ministry of Agriculture regarding Jute mill industry,

11. Jute substitutes and how to fight them.

12. Duty on Pakistan jute and its effect on the Indian jute industry,

13. Jute position after the imposition of duty by the Pakistan Government,

14. Notes on enquiries from the Secretary to the Government of West Bengal to the Secretary to the Government of India, Ministry of Commerce regarding problems of increasing jute production in India, exports of raw jute, etc.

15. Notes on enquiries from the Ministry of Agriculture, Government of India, regarding the capacity of Chittagong port, consumption of jute goods, etc.

16. Further information on the capacity of the port of Chittagong for handling jute,

17. Notes prepared jointly with the Director, Jute Agricultural Research, on enquiries from Vice-Chairman, Indian Council of Agricultural Research, regarding problems of increasing jute production in India.

18. Village consumption of jute in the Dominion of India,

19. Notes on enquiries from Secretary to the Government of India, Ministry of Agriculture, regarding Mill demand for raw jute, East Bengal crop for 1947, etc.

20. Future long term prospects of the jute industry in the Indian Union,

21. Estimated revenue from Pakistan duty on raw jute,

22. Present position of the jute trade and industry,

23. Present position of substitutes for jute,

24. Note on improving jute forecast and estimating cost of production,

25. Exports of raw jute and jute goods to Pakistan.

These notes were forwarded to the Government of India.

FUTURES MARKET FOR LOOSE JUTE

At its meeting held in December, 1947, the Committee directed the Director of Economic Research to go into the question of a Futures Market for loose jute to determine whether it was a practicable proposition. A detailed investigation of this question has been undertaken and both Indian and foreign futures markets are being studied in this connection. A report on the subject is also under preparation.

SUBSTITUTES FOR JUTE

The Local Sub-Committee at its meeting held in September, 1947, considered the recent attempts made in foreign countries to replace jute by substitutes. The Economic Research Section was directed by the Sub-Committee to prepare a comprehensive statement of the case, giving a full and up-to-date history of the growth of substitutes, the present and possible future effects of these substitutes on the jute trade and suggesting steps that may be taken to meet the situation. Accordingly, a comprehensive report on the subject was prepared and submitted to the Sub-Committee for consideration. In this report the history of substitutes since 1926 has been traced and analysed to lay bare the basic causes responsible for the growth of substitutes. The most important factors favouring substitutes appear to be :—

(1) Relative prices of jute and its products on the one hand and substitutes on the other.

(2) Scarcity of jute and products.

(3) The search by a country for new uses for its surplus material even at the cost of subsidization.

(4) Policy of national self-sufficiency.

It may be possible to take remedial measures in this country with regard to (1) and (2), but it is perhaps beyond the power of

India to control the other two factors. All our efforts should, therefore, be directed to maintaining an adequate supply of jute to meet world demand and also to regulating jute prices in such a way that they maintain their parity with prices of substitutes.

Measures to fight substitutes have also been suggested in the report along following lines :—

(1) Adequate supply of raw jute and jute goods.

(2) Reduction of cost of production of jute and jute goods.

(3) Reduction of cost of living of workers and cultivators in order to bring down prices of jute and jute goods.

(4) Expansion of markets for jute goods along established lines.

(5) New uses of jute.

As the Indian Jute Mills Association was also studying the problem of substitutes, the Local Sub-Committee decided that the Director of Economic Research should carry out the investigation in close collaboration with the Indian Jute Mills Association. The Director of Economic Research personally discussed this proposal with the Indian Jute Mills Association Research Institute and the latter agreed to it. In a subsequent meeting held in January, 1948, the Local Sub-Committee directed the Director, Economic Research, to prepare a comprehensive list of fibres and other materials competing with jute. As regards the quantitative aspect of the question, the Sub-Committee was given to understand that the Indian Jute Mills Association had undertaken the task of collecting data regarding them. It was further decided that the Indian Central Jute Committee would also contribute all the data it could collect.

The comprehensive list of jute substitutes is under preparation. The Section is also engaged in analysing all data and information relating to the post-war growth of jute substitutes to see how far they have affected the jute trade.

BROCHURE ON JUTE STATISTICS

This brochure contains 76 primary tables and 51 summary tables. All the tables have been thoroughly checked, scrutinised and brought up to date. The brochure is practically complete and will be made ready for publication shortly.

MISCELLANEOUS

Several enquiries were received from various sources after the partition. These were attended to and the information asked for was promptly supplied.

An Officer of the Food and Agriculture Organization of the United Nations came to collect some information on production, stock and export of jute and jute goods. The data asked for were supplied to him, which were also published by the F. A. O. in its publication entitled "World Fibre Survey" (1947).

Arrangements have been made to receive regular reports from the Trade Commissioners appointed by the Government of India in foreign countries regarding the condition of the jute trade in those countries. These are published in the "Jute Bulletin" of the Committee.

PUBLICATIONS

The following is a list of publications prepared by the Economic Research Section :—

1. *Ghosh, D.*—An economic analysis of the American market for jute and jute manufactures (In press).
2. *Ghosh, D.*—Basic principles of Grading applied to raw jute (A note in "The Grading of Jute," Indian Central Jute Committee).
3. *Basak, K. C.*—World Consumption of Jute (Economic Research Memoir No. 1).
4. *Ganguli, S. M.*—Jute Consumption in cordage & twine in U. S. A. (*Fabric*, November and December, 1947).

5. *Sarkar, D. C.*—Jute and some of its substitutes (*Jute Bulletin*, Indian Central Jute Committee, March, 1947).

6. *Sarkar, D. C.*—Jute production in Brazil and Argentine (*Jute Bulletin*, Indian Central Jute Committee, July, 1947).

ACKNOWLEDGMENTS

The Economic Research Section is grateful to the Government Trade Commissioners, the Indian Jute Mills Association, Messrs. J. C. Duffus & Co. and various other trade bodies and associations for their valued help and co-operation in all matters. This Section is also indebted to the authorities of the Governments of West Bengal, Assam, Bihar and Orissa for help received from them in organising centres for the investigation into the economics of jute growing. The Director also takes this opportunity to record his appreciation of the willing co-operation of his staff who had to work under great strain during the difficult period under review.

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K. C. BASAK

Offg. Director of Economic Research

APPENDIX

Programme of Work for 1947-48	Progress made	Future work
1. Investigation into the economics of jute growing.	The investigation for jute in 1947 was completed at 5 centres in East Bengal. These centres were closed down at the end of December, 1947, and consequently the enquiries relating to paddy and winter crops could not be finished. Report on the 1947 enquiry has been prepared. Five new centres have been opened in the Indian Dominion—2 in West Bengal and one each in Bihar, Orissa and Assam. Work is under progress.	The work in the five new centres should be continued at least for five years.
2 Study of mofussil prices and other statistics.	Enquiry at Sarisabari was completed and a report was submitted for the Committee's consideration.	The investigation will be continued for one year from July, 1948, at the five centres selected for the investigation into the economics of jute growing.

3. Study of the Indian Market for jute goods.	A scheme was drawn up which was approved by the Committee.	Work on the scheme will begin as soon as sanction from Government of India is received. The investigation is expected to be completed in two years.
4. Statistical analysis of data on physiology of jute.	Statistical analysis of data for 1945-46 was completed in September, 1947, and an interim report was submitted giving some of the results of the analysis. A report on the remaining parts of the analysis has been prepared. Data for 1946-47 have been taken up for analysis.	The analysis of the data for 1946-47 is expected to be completed by September, 1948.
Other investigations not included in the programme of work.		
5. Problems of jute industry arising out of the partition of Bengal.	A large number of notes on these problems were prepared and forwarded to the Government of India.	

APPENDIX

Programme of work for 1947-48	Progress made	Future work
6. Futures market for loose jute.	A detailed investigation of the subject has been undertaken and a report is also under preparation.	Some more time will be required to finish the investigation and the report.
7. Substitutes for jute ..	A comprehensive report on the history and development of and possible remedies for jute substitutes was prepared.	Further work on the subject will be done in collaboration with the Indian Jute Mills Association.
8. Brochure on jute statistics	Tables have been checked, scrutinised and brought up to date.	The brochure will be made ready for publication shortly.

ANNUAL REPORT OF THE PUBLICITY SECTION FOR THE YEAR 1947-48.

During the period under review the Publicity Section experienced difficulties in executing the programme of work according to plan due to the Publicity Officer having suddenly fallen ill in mid-April and his subsequent prolonged confinement to bed up to about mid-September. Consequently, the staff had to work very hard for the remaining part of the year to make leeway. Taking into consideration this initially handicapped position, the progress since made by the Publicity Section may be considered satisfactory.

A resume of the work done during the period is given below :—

JUTE BULLETIN

Except during the period of the Publicity Officer's enforced absence, the JUTE BULLETIN continued to be published regularly every month.

It is not a little encouraging to note that in its career as a priced publication, the BULLETIN has been attracting an ever-widening circle of readers, not only from India but also from the Philippines, the U. K., the U. S. A., the U. S. S. R., France, South Africa, South America, Holland, Canada, China and Australia—a fact from which can be gauged the BULLETIN'S popularity as a regular authoritative vehicle disseminating all available authentic information on the production, consumption, stocks, prices and imports and exports of jute and jute manufactures in all countries interested in jute, as also on potential jute substitutes which may have a direct or indirect bearing on Indian jute.

The JUTE BULLETIN has continued to fulfil another important function, namely, that of giving systematic publicity to the important activities of the different research sections of the Committee. Items of information in this regard are often bodily reproduced and prominently displayed in foreign journals.

The BULLETIN has continued to obtain a good press both in India and abroad. Appreciating the importance of the items of information that go to make up the journal, the Press-Summary issued by this Section every month, has continued to be widely utilised by important journals for the benefit of their own circle of readers. It will thus be seen that all available information on jute has been conveyed not only to the readers of the BULLETIN, but also to a far wider circle.

EDITORIAL BOARD

The Editorial Board which was formed last year with the Vice-President, the Secretary and all the Sectional Heads as ex-officio members and the Publicity Officer as ex-officio Editor, held six meetings during the period under review. Besides formally approving the draft of the JUTE BULLETIN month to month, they made a few recommendations to make the BULLETIN more attractive and popular. As a step in this direction, a provision of Rs.1,000 was recommended to be made in the budget of the Publicity Section for the remuneration of contributors of outstanding articles on jute and allied subjects to the JUTE BULLETIN, which the Local Sub-Committee subsequently sanctioned.

In pursuance of the decision of the Editorial Board the name of the journal has been changed from BULLETIN to JUTE BULLETIN with effect from its April 1947 issue.

ADVERTISEMENT IN THE BULLETIN

Advertisements in the JUTE BULLETIN booked during 1947-48 amounted to Rs. 1,521 in value (gross) as compared to Rs. 1,170 (gross) in 1946-47.

PRESS PROPAGANDA

The progress with regard to Press Propaganda may be regarded as satisfactory, considering the pressure on space of all newspapers and journals consequent on the epoch-making political developments in the country and abroad during the period under review. Thirty

Press and Un-official Notes were issued during the year and most of them were accorded due publicity,

Some of the subjects dealt with were :—

(i) JUTE MANUFACTURE IN BRAZIL;

(ii) CEYLON STOPS BAG SUPPLY TO S. AFRICA;

(iii) METHODS OF JUTE TESTING;

(iv) TWIST FACTOR IN JUTE YARN;

(v) A NEW PEST OF JUTE;

(vi) INDIA'S SELF-SUFFICIENCY IN JUTE ; and

(vii) "GROW MORE JUTE".

RADIO PUBLICITY

The authorities of the Calcutta Station of All-India Radio have continued to broadcast extracts from important Press-Notes issued by the Section.

PRICE DISSEMINATION SCHEME

The Bengal Government having themselves taken up the dissemination of Calcutta loose jute prices for the Province of Bengal, this section confined its activities in this connection to the jute-growing Provinces of Bihar, Orissa and Assam. Price cards containing the Calcutta loose jute market quotations were sent daily, excluding holidays, to :—

9 centres in Bihar

4 " in Orissa, and

23 " in Assam.

Following the partition of the country two centres in Assam having fallen within Pakistan, the service to these two centres was discontinued.

NEW RELEASES

During the year under report the Publicity Section released five new publications of the Indian Central Jute Committee. They were :-

(i) TECHNOLOGICAL CIRCULAR NO. 1—dealing with suitable methods of sampling,conditioning and testing jute yarn from a standard spin ;

(ii) TECHNOLOGICAL CIRCULAR NO. 2—on "Twist Factor in Jute Yarn",

(iii) TECHNOLOGICAL RESEARCH MEMOIR NO. 11—on "Storage of Sugar";

(iv) AGRICULTURAL RESEARCH MEMOIR No. 4—on the "Technique of Field Experiments in Jute", and

(v) COMMITTEE'S ANNUAL REPORT FOR 1945-46.

SALE AND DISTRIBUTION OF PUBLICATIONS

The total number of the Indian Central Jute Committee publications, other than the BULLETIN, sold and distributed free during 1947-48 were 660 and 688 respectively, as compared to 1,120 and 1,259 respectively during 1946-47. It may be noted here that due to several of the publications having run out of stock during the period it was not possible to meet the greater demand.

JUTE MUSEUM

Satisfactory progress has been made in the setting up of the Central Jute Museum. Several useful charts and posters on the economic and marketing side of jute and technical aspects have been prepared, and specimens of jute manufactures and botanical exhibits have also been collected. These are now on private display covering a floor-space of about 1,424 sq. ft. at headquarters. Following some further progress and appointment of the necessary minimum staff it is intended to declare open the Jute Museum to the public some time next year, and also commence participating in important exhibitions.

It is a matter of gratification to note that even in its embryonic stage the Museum has been attracting appreciative visitors. Some gentlemen from the U. S. A. escorted by a representative of the local American Consulate-General happened to drop in recently. After going round the Museum the party congratulated "the Committee on having such a useful and instructive Museum".

ACKNOWLEDGMENTS.

The encouraging progress so far attained in organising the Jute Museum has not to a little extent been made possible by the ungrudging help and co-operation extended to the Publicity Section by the Indian Jute Mills Association, Birla Jute Manufacturing Co. Ltd., Howrah Mills Co. Ltd., and the different sectional heads of the Committee. The Publicity Officer takes this opportunity of expressing his thanks to them. To the Press and news agencies, inland and overseas, and All-India Radio thanks are also due for their help and co-operation in their own spheres. To the staff of the Publicity Section, who being very small in number had to work hard, the Publicity Officer takes this opportunity of expressing his appreciation.

PROGRAMME OF WORK

The following is the programme of work of the Publicity Section approved by the Indian Central Jute Committee :—

(i) Production and distribution of the monthly BULLETIN ;

(ii) Press campaign by means of Press-Notes and articles illustrated with pictures in the Press ;

(iii) Arrangements for broadcasting Radio talks ;

(iv) Preparation and distribution of posters, as necessities arise ;

(v) Preparation and distribution of propaganda leaflets and pamphlets ;

(vi) The July issue of the JUTE BULLETIN to be an enlarged edition to serve the purpose of a "Jute Annual" ;

(vii) Loose Jute Price Dissemination Scheme ;

(viii) Organisation of a Central Jute Museum ;

(ix) Sale and distribution of all publications of the Indian Central Jute Committee.

While considering the Annual Report of the Publicity Section for 1946-47, in December, 1947 the Indian Central Jute Committee "inter alia" recommended the inclusion of the following items in the programme of the Publicity Section :—

(a) that Hindi leaflets should be prepared for the Province of Bihar describing the results of researches which can be adopted by the cultivators and distributed to the cultivators through the Provincial Government ;

(b) that posters with attractive photographs and pictures on the lines adopted by the Indian Central Sugarcane Committee, should be prepared and widely distributed throughout the jute-growing areas in the Indian Union;

(c) that demonstrations in villages or groups of villages should be undertaken by the Publicity Section.

K. I. A. Quaderi
Publicity Officer.

APPENDIX.

A tabular statement indicating the Sanctioned Programme of work of the Publicity Section and the Progress made under each item.

Programme Sanctioned	Progress made	Remarks
(i) Production and Distribution of the monthly BULLETIN	Produced and distributed regularly every month except in the earlier part of the year;	Due to Publicity Officer's serious prolonged illness work was hampered in the earlier part of the year.
(ii) Press campaign by means of Press-notes and articles illustrated with pictures in the Press;	30 Press-notes issued and published;	Due to the abnormal times it was not possible to have illustrated articles published in the press.
(iii) Arrangements for broadcasting Radio talks;	Extracts from important press-notes were broadcast through the courtesy of the All-India Radio authorities.	

APPENDIX (contd.)

A tabular statement indicating the Sanctioned Programme of work of the Publicity Section and the Progress made uuder each item.

Programme Sanctioned	Progress made	Remark
(iv) Preparation and distribution of posters, as necessities arise;		No occasion arose during the period.
(v) Preparation and distribution of propaganda leaflets and pamphlets;	"Grow More Jute" leaflets were distributed.	
(vi) The July issue of the JUTE BULLETIN to be an enlarged edition to serve the purpose of a "Jute Annual";		Work is proposed to be taken up in this connection in June next.
(vii) Loose Jute Price Dissemination scheme;	Calcutta Loose Jute Market quotations were sent to 36 centres of Bihar, Orissa and Assam;	Bengal Government have taken over the operation of this scheme so far as Bengal is concerned.

(viii) Organisation of a Central Jute Museum;	A respectable collection of exhibits has been made. It may be possible to declare it open to the public some time next year.	
(ix) Sale and publication of all publications of the Indian Central Jute Committee other than the BULLETIN;	Satisfactory progress has been maintained 660 copies were sold and 688 distributed free	Several inportant publications having run out of stock demands could not be met in full.
(x) Preparation of Hindi leaflets for Bihar and their distribution;	Steps are being taken in this direction in consultation with the Government of Bihar.	
(xi) Preparation of posters on the lines adopted by the Indian Central Sugarcane Committee;	The Sugarcane Committee having not yet done anything in this line as the Secretary informs in a lettar a separate scheme is being put up before the Local Sub-Committee.	
(xii) Demonstration work in villages or groups of villages ;	Necessary equipment not being available so long, no progress could be made. It now appears that these may be available between July and August next. A scheme in this connection will be put up before the Local Sub-Committee in due course.	

N. B. Items (x), (xi) and (xii) in the above were included in the programme of work of the Publicity Section by the Indian Central Jute Committee in December, 1947 while considering the annual report of the Section for 1946-47.

APPENDIX VI

List of Members of the Indian Central Jute Committee on the 1st April, 1948.

1.	*Ex-officio* President	Sardar Datar Singh, Vice-Chairman, Indian Council of Agricultural Research and Additional Secretary to the Govt. of India, Ministry of Agriculture, New Delhi.
2.		The Agricultural Commissioner with the Govt. of India, Ministry of Agriculture, New Delhi.
3.	Four persons nominated by the Govt. of India.	1. Sir A. H. Ghuznavi, M.L.A., 19, Strand Road, Calcutta. 2. Mr. Lakshmipat Singhania, Kamala Tower, Cawnpore. 3. Prof. M. N. Saha, F.R.S. University College of Science, 92, Upper Circular Road, Calcutta. 4. Mr. K. K. Chetteur, M.A., Jt. Secretary to the Govt. of India, Depertment Commerce, New Delhi.
4.	A representative of the Agriculture Dapartment of the Govt. of West Bengal nominated by that Govt.	The Director of Agriculture, Animal Husbandry and Fisheries, West Bengal, Writers' Building Calcutta.
5.	A representative of the Agricultural Department of the Govt. of Bihar, nominated by that Govt.	The Director of Agriculture, Bihar, Patna.

6.	A representative of the Co-operative movement in West Bengal nominated by the Govt. of West Bengal.	The Registrar of Co-operative Societies, West Bengal, 8 Lyons Range, Calcutta.
7.	Two members elected by the Indian Jute Mills Association.	1. Mr. I. G. Kennedy, C.B.E. C/o Messrs Jardine Skinner & Co., 4, Clive Row, Calcutta. 2. Mr. D. I. Duff, C/o Messrs. Barry & Co., 2, Fairlie Place, Calcutta.
8.	One member elected by the Bengal Chamber of Commerce	Mr. J. M. Smart, C/o Messrs. Landale & Clarke Ltd., 11, Clive Street, Calcutta.
9.	One member elected by the Bengal National Chamber of Commerce	Mr. D. P. Goenka, C/o Messrs. Ramdutt Ramkissen Das. 4, Clive Ghat Street, Calcutta.
10.	Two members elected by the Indian Chamber of Commerce	1. Mr. K. D. Jalan. C/o Messrs. Suraj Mull Nagra Mull, 8, Dalhousi Sq., East, Calcutta. 2. Mr. Bhagirath Kanoria, C/o Messrs. The General Produce Co., Ltd. 8, Royal Exchange Place, Calcutta.
11.	One representative of the Shipping and Baled Jute interests nominated by the Calcutta Baled Jute Association	Mr. G. Euthymopulo, C/o Messrs. Rally Brothers, 16, Hare Street, Calcutta.

12. One Representative of the Jute Trade nominated by the Govt. of Bihar.	Mr. Mohanlal Jeloka, Katihar, District—Purnea.
13. One representative nominated by the Govt. of Assam.	Mr. S. A. Rouf, B.L., Berpeta, Assam.
14. Three representatives of Agricultural interests of West Bengal nominated by the Govt. of West Bengal.	1. Sree Haripada Chatterjee, Krishnagar, Nadia. 2. Sri Kishori mohan Das, President, Basirhat Sub-Divisional Congress Committee Basirhat, 24 Parganas. 3. Sree Sudhangshu Sekhar Singha Roy, M.A., B.L. Kaikala, District Hoogly.
15. Two jute growers to be nominated by the Govt. of Assam.	1. The Director of Agriculture, Assam, Shillong. 2. Mr. Purandar Sharma, M.L.A. Mangaldai, District Darrang, Assam.
16. Two jute growers to be nominated by the Govt. of Bihar.	1. Rai Bahadur Raghubans Prasad Singh, Kursela, P. O. Ayodhyaganj Bazar, Sadar Sub-Division, District, Purnea. 2. Mr. Baidyanath Chowdhury, President, District Congress Committee, Purnea.
17. One member nominated by the Govt. of Orissa to represent interests of Orissa.	The Director of Agriculture, Orissa, Cuttack.
18. One member to be nominated by the Govt. of United Provinces to represent the interests of U.P.	Mr. John A. Manwar, M.A., B.Sc. (Edin.) Deputy Director, Headquarters, United Provinces.

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APPENDIX VII

List of members of the Standing Sub-Committee of the Indian Central Jute Committee.

Local Sub-Committee

1. Mr. I. G. Kennedy, C.B.E. *Chairman.*
2. Sir Abdul Halim Ghuznavi
3. Mr. D. I. Duff
4. Mr. J. N. Smart
5. Mr. K. D. Jalan
6. Prof. M. N. Saha, F.R.S.
7. Mr. Haripada Chatterjee, M.L.A.
8. Mr. Kishori Mohan Das
9. Sri Sudhangsu Sekhar Sinha Roy, M.A., B.L.

Agricultural Research Sub-Committee

1. President
2. Agricultural Commissioner with the Govt. of India
3. Mr. Lakshmipat Singhania
4. Director of Agriculture, West Bengal
5. Director of Agriculture, Assam
6. Mr. Purandar Sarma
7. Rai Bahadur Raghubans Prasad Singh
8. Mr. Baidyanath Chowdhury
9. Director of Agriculture, Bihar.
10. Director of Agriculture, Orissa
11. Mr. John A. Mannwar
12. Mr. S. A. Rrouf
13. Mr. Sudhanshu Sekhar Sinha Roy

Co-opted Members

14. Prof. S. P. Agharkar, M.A., Ph.D., F.N.I
15. Prof. S. N. Bose, M.Sc., F.N.I.
16. Dr. J. N. Mukherjee, D.Sc., C.B.E.

Technological Research Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E.
3. Agricultural Commissioner with the Govt. of India.
4. Mr. Lakshmipat Singhania.
5. Prof. M. N. Saha, F.R.S
6. Mr. D. I. Duff.
7. Mr. D. P. Goenka.
8. Mr. K. D. Jalan.
9. Mr. Bhagirath Kanoria.
10. Mr. Mohan Lal Jeloka.
11. Rai Bahadur Raghubans Prosad Singh.
12. Dr. P. K. Parija.
13. Mr John. A. Mannwwar.

Co-opted Member

14. Mr. S. E. Kumana.
15. Dr. W. G. Macmillan, Ph. D.
16. Prof. B. C. Guha D. Sc.
17. Prof. J. K. Chowdhury, D.Sc., F.N.I.
18. Dr. S. Krishna.

Marketig Sub-Committee.

1. President
2. Mr. I. G. Kennedy, C. B. E.
3. Sir Abdul Halim Ghuznavi
4. Director of Agriculture, West Bengal
5. Registrar of Co-operative Societies, West Bengal
6. Director of Agricnltture, Bihar
7. Mr. D. P. Goenka
8. Mr. Bhagirath Kanoria
9. Mr. Kishori Mohan Das
10. Director of Ag.icultuie, Assam
11. Mr. Purandar Sarma
12. Mr. Baidyanath Chowdhury

Co-opted Members

13. Director of Agricultural Marketing, West Bengal
15. Mr. D. K. Sanyal, O.B.E., Secretary, Appointment & Information Board, Calcutta University

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Economic Research & Pnblicity Sub-Committee.

1. President
2. Mr. I. G. Kennedy, C.B.E.
3. Mr. Lakshmipat Singhania
4. Mr. K. K. Chatteur, M.A.
5. Director of Agriculture, West Bengal
6. Director of Agriculture, Bihar
7. Mr. D. I. Duff
8. Mr. J. N. Smait.
9. Mr. K. D. Jalan
10. Mr. Haripada Chatterjee
11. Director of Agiiculture, Assam
12. Mr. Purandar Sarma
13. Director of Agriculture, Orissa
14. Prof. P. C. Mahalanobis F.R.S.
15. Prof. J. C. Sinha Ph.D.
16. Mr. D. K. Sanyal, M.A., O.B.F.
17. The Registrar of Co-operative Societies, Orissa

Agricultural Research Appointmentments Sub-Committee.

1. President
2. Dr. J. N. Mukherjee, D. Sc., C.B.E.
3. Prof. S. P. Agharkar, M.Sc., Ph.D., F.N.I.
4. Prof. S. N Bose (He is a co-opted member of the Agrl. Res.. Sub-Committee. Proposed on this Sub-Committee now as a scientific member).
5. Mr.Baidyanath Chowdhury.

Technological Research Appointments Sub-Commitlee.

1. President.
2. Sir Abdul Halim Ghuznavi.
3. Prof. M. N. Saha, F.R.S.
4. Mr. K. D. Jalan.
5. Mr. D. P. Goenka.

Economic Research and Publicity Appointments Sub-Committee.

1. President
2. Mr. I. G. Kennedy
3. Sir Abdul Halim Ghuznavi
4. Sri Kishori Mohan Das
5. Dr. J. C. Sinha (He is a Co-opted member of the E.R. & Publicity Sub-Committee. Proposed on this Sub-Committee as an expert member).

Marketing Appointments Sub-Committee.

1. President
2. Sir A. H. Ghuznavi
3. Agricultural Marketing Adviser to the Govt. of India
4. Mr. J. N. Smart
5. Mr. Mohan Lal Jeloka
6. Mr. Sudhangshu Sekhar Sinha Roy

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APPENDIX VIII

List of Scientific and other Oficers of the Indian Central Committee as on the 1st April, 1948.

Administration.

1.	Secretary	.. Mr G. C. Sen, M.A.
2.	Superintendent	.. Mr. K. B. Ray, B.Sc.
3.	Head Assistant	.. Mr. R. C. Biswas, B.Sc.
4.	Accountant	.. Mr. S. K. Acharyya, B.Sc., BL.

Marketing Section.

5.	Marketing Officer	.. Vacant
6.	Assistant Marketing Officer	.. Mr. S. M. Gupta, B.Ag.

Economic Research Section.

7.	Director ..	.. Mr. K. C. Basak, B.A., (Cantab) Offg.
8.	Statistical Officer	.. Vacant
9-11.	Statistical Assistants	.. Mr. S. M. Ganguli, M.A. Mr. D. C. Sarkar, M.A. Mr. N. B. Ganguli, M.A.
12.	Librarian ..	.. D. C. Ray, M.A.

Publicity Section

13.	Publicity Officer	.. Mr. K. I. A. Quaderi

Agricultural Research Laboratories

14.	Director ..	.. Dr. B. C. Kundu, M.A., Ph.D., F.N.I.
15.	Botanist ..	.. Vacant
16.	Assistant Botanist	.. Mr. B. Das Gupta, M.Sc.
17.	Assistant Chemist	.. Vacant
18.	Assistant Entomologist	.. Vacant
19.	Assistant Mycologist	.. Mr. T. Ghose, M.Sc.
20.	Scientific Assistant	.. Mr. S. J. Ghosh, B.Sc.
21.	Cytological Assistant	.. Mr. R. M. Dutt, M.Sc.

Agricultural Research Laboratories—contd.

22.	Head Clerk and Accountant ..	.. Mr. R. C. Chakraborty, B.A.

Technological Research Laboratories

23.	Director ..	.. Mr. C. R. Nodder, M.A., (Cantab)
24.	Manager, Experiemental Spinning Mills	.. Mr. A. S. Gillies
25.	Senior Research Physicist	Dr. K. R. Sen, D.Sc., (Dacca)
26.	Senior Research Chemist	Dr. P. B. Sarkar, D.Sc., (Dacca)
27.	Junior Research Assist (Physicist)	.. Mr. B. K. Chakrabarty, M.Sc.
28.	Junior Research Assist (Chemist)	.. Mr. H. Chatterjee, M.Sc.
29.	Head Tester	.. Mr. S. B. Bandopadhyay, M.Sc.
30.	Librarian ..	.. Mr. A. K. Sur, M.Sc.
31.	Head Clerk	.. Mr. T. C. Chakravarty,

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APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS	Rs. A. P.	Rs. A. P.
OPENING BALANCE—		
Cash in Hand	4 11 9	
With Imperial Bank of India—		
Current Account	2,40,492 3 11	
Cash at Sub-Offices	580 0 0	
Investment in 3% Government Loan, 1963/65	24,671 0 0	
		2,65,747 15 8
(A) MONEY RECEIVED UNDER RESOLUTION—		
No. F.254/34/A of the Government of India, late Department of Education, Health & Lands, dated Simla, the 28th May, 1936 ..		8,62,800 0 0
(B) OTHER MONEYS RECEIVED BY THE SOCIETY—		
(i) Proceeds realised by sale of I.C.J.C. Publications ..		1,539 9 7
(ii) Proceeds realised by sale of advertisement space in the Committee's Bulletin ..		957 8 0
(iii) Refund of Contributions to the Employees' Provident Fund		270 11 0
(iv) Miscellaneous ..		6.664 13 3
(v) Money received from Provident Fund Account (to be refunded)		3 11 0
(C) INTEREST ON INVESTMENTS		748 0 0
Carried Over ..		11,38,712 4 6

IX.

JUTE COMMITTEE.

for the year ended 31st March, 1948.

EXPENDITURE	Rs. A. P.	Rs. A. P.
ADMINISTRATION OF THE SOCIETY :		
Pay of Officers ..	12,000 0 0	
Pay of Establishment	18,290 8 0	
Allowances	19,565 5 0	
Medical Aid to the Servants of the Committee	2,715 0 3	
Contingencies	17,769 4 6	
Grant-in-aid, Contributions, etc. ..	1,115 7 0	
Interim Emergency Allowance ..	640 8 0	
		72,096 0 9
MEASURES TAKEN IN CONNECTION WITH THE WORK ON IMPROVEMENT OF THE AGRICULTURE OF JUTE.		
1. JUTE AGRICULTURAL RESEARCH LABORATORIES.		
Pay of Officers	25,022 14 0	
Pay of Establishment	14,970 13 0	
Allowances	28,102 9 6	
Supplies and Services	2,321 1 3	
Contingencies	17,380 0 4	
Grants-in-aid, Contributions, etc. ..	6,556 1 0	
Interim Emergency Allowance ..	1,491 3 0	
University Research Schemes ..	18,520 0 0	
Jute Pest Control Scheme, Narsingdi	1,345 5 0	
Subvention Farms in Bengal, Bihar Assam and Orissa	3,288 9 0	
Jute Seed Production Scheme in Assam	120 0 0	
Carried Over ..	1,19,118 8 1	72,096 0 9

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS—*Contd.*	Rs. A. P.	Rs. A. P.
Brought Forward ..		11,38,712 4 6



Carried Over ..		11,38,712 4 6

IX.

JUTE COMMITTEE.

for the year ended 31*st March*, 1948.

EXPENDITURE—*Contd.*	Rs.	A.	P.	Rs.	A.	P.
I. J.A.R.L. (*Contd.*)	1,19,118	8	1	72,096	0	9
Advance to Provincial Government for purchase of Jute seeds	14,882	5	6			
Cost of Purchase of a Station Wagon	8,500	0	0	1,42,500	13	7
II. JUTE RESEARCH REORGANISATION SCHEME :						
Recurring				13,464	3	0
III. JUTE RESEARCH SUB-STATIONS :						
Kishoreganj	9,060	3	9			
Narayanganj	3,085	9	9			
Konda	2,782	6	0			
				14,928	3	6
MEASURES TAKEN IN CONNECTION WITH IMPROVEMENT IN THE TECHNOLOGY OF JUTE ..						
RECURRING						
Pay of Officers	56,736	6	0			
Pay of Establishment	41,014	0	0			
Allowances	52,127	10	6			
Supplies and Services	15,618	12	3			
Contingencies	12,301	9	0			
Grants-in-aid and Contributions ..	6,081	15	0			
University Schemes	24,098	0	0			
Interim Emergency Allowance ..	2,508	5	0			
NON-RECURRING						
Extension of Technological Laboratories	25,452	9	3	2,35,939	3	3
				2,35,939	3	3
Carried Over		Rs.		4,78,928	8	1

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS—*Contd.*	Rs. A. P.	Rs. A. P.
Brought Forward ..		11,38,712 4 6
Carried Over ..		11,38,712 4 6

IX

JUTE COMMITTEE.

for the year ended 31st March, 1948.

EXPENDITURE—*Cobtd.*	Rs. A. P.	Rs. A. P.
Brought Forward ..		4,78,928 8 1
MEASURES TAKEN IN CONNECTION WITH THE IMPROVEMENT IN THE MARKETING OF JUTE :		
Pay of Officers	6,924 3 0	
Pay of Establishment	2,102 4 0	
Allowances	5,473 6 0	
Grants-in-aid, Contributions, etc. ..	557 12 0	
Jute Grading in Bihar ..	1,109 6 0	
do do in Assam ..	1,785 0 0	
Co-operative Marketing of Jute in Bengal	4,344 4 9	
Co-operative Marketing in Jute in Orissa	3,236 0 0	
Co-operative Jute Spinning and Weaving Societies in Bengal ..	6,637 13 6	
Interim Emergency Allowance ..	157 13 0	
Contingencies	344 7 0	
		32,672 5 3
I. ECONOMIC RESEARCH SECTION.		
Pay of Officers	12,916 2 0	
Pay of Establishment	16,127 3 0	
Allowances	15,532 15 0	
Grants-in-aid, Contributions, etc. ..	1,287 2 0	
Scheme for Economics of Jute Growing & Dr. J. C. Sen Gupta's & Marketing Schemes	18,842 2 9	
Interim Emergency Allowance ..	673 15 0	
Contingencies	5,810 10 6	
		71,190 2 3
Carried Over ..		5,82,790 15 7

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS—*Contd.*	Rs. A. P.	Rs. A. P.
Brought Forward ..		11,38,712 4 6
Total Rs. ..		11,38,712 4 6

We beg to report that we have audited the Statement of Receipts and Expenditure of the Indian Central Jute Committee for the year ended 31st March, 1948, and above set forth, with the accounts and vouchers, and have obtained all the information and explanations we have required. In our opinion, subject to our separate report, such statement correctly set forth the transactions of the Committee for the year.

CALCUTTA,
6, Hastings Street,
The 7th March, 1949.

G. Basu & Co.,
Incorporated Accountants
Registered Accountants
AUDITORS.

IX.

JUTE COMMITTEE.

for the year ended 31st March 1948

EXPENDITURE—*Contd.*	Rs. A. P.	Rs. A. P.
MISCELLANEOUS (*Contd.*).		
Brought Forward ..		5,82,790 15
II. PUBLICITY SECTION.		
Pay of Officers	5,982 6 0	
Pay of Establishment	4,701 10 0	
Allowances	7,091 14 0	
Contingencies	6,054 6 3	
Grants-in-aid, Contributions, etc. ..	584 6 0	
Interim Emergency Allowance ..	299 4 0	
Museum	10,323 10 9	
		35,037 9 0
III. SCHEME FOR THE EMPLOYMENT OF SPECIAL AGRICULTURAL STAFF IN JUTE GROWING AREAS :		
Bengal	50,831 1 0	
Bihar	9,543 11 1	
Assam	6,326 5 0	
Orissa	3,465 0 0	
		70,221 1 1
BALANCE ON 31ST MARCH 1948		
CASH BALANCE (Certified)		
In hand	262 11 9	
With Imperial Bank of India on Current Account	4,25,148 15 1	
At Sub-Offices	589 0 0	
Investment in 3% Government Loan, 1963-65, Brought Forward ..	24,671 0 0	
		4,50,662 10 10
		11,38,712 4 6

Summary of Receipts and Expenditure of the Indian Centarl Jute

1-42 7	1942-43 8	1943-44 9	1944-45 1	1945-46 11	1946-47 12	1947-48 13	Total 14
3,437	2,04,731	73,321	2,15,730	1,79,168	2,00,015	2,65,748	14,88,663
5,300	3,52,420	4,90,000	5,00,000	5,80,800	7,30,000	8,62,800	57,60,820
9,257	3,500	4,745	11,087	8,014	363	—	2,36,966
5,814	31,593	6,222	10,211	6,153	11,740	9,416	85,635
2,193	1,715	901	955	951	857	748	15,326
..	49,342	..	..	..	..	..	99,030
7,001	6,43,301	5,75,189	7,37,983	7,75,086	9,42,975	11,38,712	76,86,440

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ittee from its inception in 1936-37 to 1947-48.

EXPENDITURE

Details of expenditure 1	1936-37 2	1937-38 3	1938-39 4	1939-40 5	1940-41 6	1
Administration of the Committee	15,374	68,988	67,778	69,359	67,789	
Measures taken in connection with work on the improvement of the Agriculture of jute	..	24,686	35,499	44,724	49,329	
Measures taken in connection with improvement in the Technology of jute ..	..	1,61,782	2,98,791	1,20,543	1,09,876	1
Measures taken in connection with improvement in the Marketing of jute ..	..	16,744	54,449	44,471	43,364	
Scheme for the improvement of jute Forcast ..	..	13,984	69,964	89,359	1,17,867	1
Scheme for Economic Research and Publicity on jute	..	2,135	4,490	8,144	19,505	
Scheme for the employment of Special Agricultural Staff in Bengal, Bihar Assam, and Orissa ..	..	15,121	52,944	64,103	65,909	
Permanent advancef account for supply or jute seeds of improved vaieties	..	..	49,688	49,342	..	
Miscellaneous ..	..	..	112	20	10	
Closing balance ..	4,626	2,02,424	27,814	51,649	63,437	2
Total ..	20,000	5,05,864	6,61,529	5,41,714	5,37,086	6,


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42	1942-43 8	1943-44 9	1944-45 10	1945-46 11	1946-47 12	1947-48 13	Total 14
018	56,969	53,066	52,287	60,426	65,926	72,096	7,20,077
253	82,083	97,511	91,556	1,18,801	1,40,058	1,70,893	9,10,393
,111	1,97,922	1,54,849	1,52,490	1,63,902	2,07,443	2,35,939	19,06,648
,463	44,725	27,501	25,936	41,964	55,361	32,672	4,09,650
,612	22,039	..	6,000	..	..	..	4,49,825
,785	21,994	26,246	46,079	65,961	79,368	1,06,228	400,935
.	1,43,513	286	1,83,248	1,21,606	1,29,070	70,221	8,46021
.	..	..	..	..	..	..	99,030
28	735	..	1,219	2,411	..	..	4,535
4,731	73,321	2,15,730	1,79,168	2,00,015	2,65,748	4,50,663	19,39,326
,091	6,43,301	5,75,189	7,37,933	7,75,036	9,42,975	11,38,712	76,86,440

RECEIPTS

Sources of receipt.	1936-37 2	1937-38 3	1938-39 4	1939-40 5	1940-41 6
Opening balance . . .	. .	4,626	2,02,424	27,814	51,649
Grant-in-aid received from the Government of India	20,000	5,00,000	4,25,000	4,25,000	4,18,500
Contributions received from the Provincial Governments towards the cost of the schemes undertaken by the Committee	. .	. .	32,500	35,000	62,500
Other moneys received by the Committee . .	. .	113	580	1,472	2,321
Interest received from investment of the funds of the Committee	. .	1,125	1,025	2,740	2,116
Transfer from the permanent advance account opened for supply of jute seeds of improved varieties . .	. .	. .	. .	49,688	. .
Total . .	20,000	5,05,864	6,61,529	5,41,[illegible]	

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APPENDIX XI

Abstract Revised budget estimates of the Indian Central Jute Committee for the year 1947-48 *and budget estimates for the year* 1948-49.

SCHEMES	Revised estimates for 1947-48	Budget estimates for 1948-49
	Rs.	Rs.
1. Administration	95,200	79,600
2. An Enquiry into the Marketing and Transport of Jute and its products.	39,700	16,100
3. A Scheme of Agricultural Research on Jute.		
(1) Jute Agricultural Research Laboratory including Agricultural Research Sub-stations	1,81,700	1,56,900
(2) Organisation of the J.A.R.L. in the Indian Union	2,15,000	4,00,000
5. A Scheme for setting up of an Institute for research on the Technology of Jute.		
(I) Technological Research Laboratories ..	2,39,900	2,10,900
(II) Proposed New Scheme for extension of the work of the Technological Research Laboratories.	56,100	14,200
(III) A Scheme for the Re-organisation of the Technological Research Laboratories	1,49,500	4,29,050
5. A Scheme for the collection and distribution of Statistics and Information on Jute.		
(*a*) Economic Research Section ..	84,500	1,22,542
(*b*) Publicity Section	35,200	37,300
6. A Scheme for the Employment of Special Agricultural Staff in the Jute areas	96,100	71,400
6. Measure taken in connection with the production and distribution of jute seeds of the improved varieties	1,50,000	—
8. Funds required for the implementations of the Pay-Commission's recommendations ..	59 000	48 000
Total ..	14,01,900	15,85,992
Add closing bal nce ..	20,000	20,000
	14,21,900	16,05,992


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ANNUAL REPORT

OF THE

INDIAN CENTRAL JUTE COMMITTEE

FOR THE YEAR

1948-49.

Calcutta

1949

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ANNUAL REPORT OF THE INDIAN CENTRAL JUTE COMMITTEE FOR THE YEAR 1948-49

CONSTITUTION AND PERSONNEL

It is now a known fact that, consequent on the partition of India into two dominions, the Indian Central Jute Committee started functioning in the Indian Dominion with modified constitution from December, 1947 under the orders of the Government of India, Ministry of Agriculture. All the organisations, such as, Jute Agricultural Research activities and the Economic investigation centres of the Indian Central Jute Committee, which were located in Eastern Pakistan were wound up and corresponding new organisations were set up from the beginning of the year under report (1948-49).

A list of the members of the Committee as on the 1st April, 1949, showing the constituencies they represent according to the revised constitution will be found in Appendix.

INCREASED PRODUCTION OF JUTE IN THE INDIAN UNION

As a result of the partition, the most important problem that faced India was an acute shortage of raw jute to meet the requirements of her jute mills. The Indian Central Jute Committee viewed the position with great concern and the Government of India, alive to the importance of the increased production of jute within its own borders, quickly sanctioned a three year scheme of increased production of jute recommended by the Indian Central Jute Committee and prepared by its Director of Agricultural Research Institute, Dr. B. C. Kundu, M.A., Ph.D., F.N.I. at an average cost of Rs. 11.2 lakhs. Under this scheme, the increased production of jute is to be carried out by (*a*) bringing under jute cultivation as much area as possible without affecting the area under food crop, (*b*) by double cropping, (*c*) by utilising waste culturable land, (*d*) by increasing the yield by use of manures and improved jute seeds and (*e*) by trying to grow jute in new areas.

The target of additional acreage to be brought under jute cultivation in the Indian Dominion during 1949-50 is fixed at 2,77,000 acres with an expected yield of about 7 lacs bales of jute.

For working the scheme, 3 Assistant Development Officers, 9 Inspectors and 84 Field Assistants have been appointed in the different provinces of West Bengal, Bihar, Assam, Orissa and Travancore. They were given a short course of training in the Jute Agricultural Research Institute on all aspects of jute cultivation and marketing of jute, before they were sent out to the various centres.

The staff appointed has carried on village to village propaganda through meetings of cultivators and leaflets distributed among them to adopt improved methods of jute cultivation and utilise every inch of spare land without affecting food crop.

The seeds and fertilisers have been distributed to the cultivators through the Provincial Departments of Agriculture.

The Committee has paid a total sum of Rs. 50,000/- as subsidy to the Provincial Governments of Assam, Orissa, and U. P. for the purchase of jute seeds. The quantities of seeds distributed in the various provinces and States are shown below :—

West Bengal	...	500 mds.
Orissa	...	685 mds.
U.P.	...	500 mds.
Madras	...	37 mds.
Travancore	...	263 mds.
Cooch Behar	...	65 mds.
Tripura	...	5 mds.

Small quantities of seeds were also supplied to other new areas like Bombay, Bangalore, Rajasthan, Central Provinces and Andamans for experimental purposes.

The Government of India have alloted a quota of 6,000 tons of Ammonium Sulphate for distribution to the jute

growing provinces of West Bengal, Bihar and Orissa as follows:—

West Bengal	...	3,000 tons
Bihar	...	2,000 tons
Orissa	...	1,000 tons

Printed leaflets explaining the efficacy of Ammonium Sulphate for jute production have been widely distributed among the cultivators through the Jute Development Staff.

Further, the experiments carried out in the Jute Agricultural Research Institute have proved that the cost of cultivation can be reduced considerably, and the yield increased if jute is sown in *lines* and not *broadcast* and if all intercultural operations are given by "wheel-hoes" instead of hand labour. Consequently, 40 wheel-hoes have been supplied to the Field Assistants in different centres for purposes of demonstrations in plots where jute has been sown in *lines*. Illustrated pamphlets, printed in Bengali and Hindi, showing the usefulness of "wheel-hoes" and the way to use them, have been distributed among the cultivators. The practical demonstrations given by the Feld Assistant has aroused great interest amongst the growers and there has been great demand for *"wheel-hoes."*

In order to attain self-sufficiency in the matter of production of raw jute, the essential pre-requisite is to have an assured supply of improved seeds. For this purpose the urgency of establishing jute seed multiplication farms in the jute growing provinces has been stressed and as an encouragement the Committee has offered to share with the provincial governments 50% of the recurring costs of these farms.

In response,

(1) The Government of Orissa have taken steps to establish one 110 acre jute seed multiplication farm at Sukinda in Orissa;

(2) The Government of U.P. have acquired 300 acres for jute seed multiplication farm, without financial aid from the Committee;

(3) The Government of West Bengal have taken steps to acquire necessary land for setting up a jute seed multiplication farm at Raiganj in West Dinajpur;

(4) Assam has proposed to multiply seeds in the District Seed Farms in about 60 acres of land pending the establishment of Seed Multiplication Farm there;

(5) Only, the Government of Bihar States that their province can establish jute seed multiplication farms only if the Indian Central Jute Committee meets the entire cost (both recurring and non-recurring) on this account.

In the meantime, steps have also been taken to multiply a limited quantity of improved Jute Seed (60 mds.) through registered growers in different provinces and it is expected that the Committee will be in a position to offer about 4000 mds. of improved jute seeds to the growers in the next growing season.

In view, however, of the importance of the improved variety of seed for jute production, the Local Sub-Committee of the Indian Central Jute Committee feels that the only way to provide an adequate supply of improved strains will be to establish the Jute Seed Multiplication Farms directly under the Government of India or under this Committee.

For studying the possibilities of growing jute in new areas, experiments are being conducted in Travancore, Madras and Bombay on a pilot plan basis. The results of these experiments will be watched with interest for cultivation on a wider scale in future years.

The intensive efforts for increased production of jute are expected to bear the desired fruit of reaching the target fixed for the years. The rough survey by our Development Staff indicates that additional acreage under jute during 1949 is about 3,37,457 with an expected yield of about 8.8 lakhs bales.

It must be mentioned that Sardar Datar Singh, Additional Secretary to the Government of India, Ministry of Agriculture

and President, Indian Central Jute Committee, has taken a personal interest in piloting the scheme and but for his keen and personal efforts it would have been difficult to go ahead with this big scheme in such a short time. Dr. B. C. Kundu, Director Jute Agricultural Research and his staff have put forth a sincere and devoted effort to make this scheme a success. The members of the Local Sub-Committee have kept constant sympathetic and understanding watch over the progress of the scheme and have given valuable directions and criticism for the proper working of the scheme. The Provincial Governmnts of West Bengal, Bihar, Assam, Orissa and U. P. have given their fullest co-operation in helping the increased production of jute.

JUTE AGRICULTURAL RESEARCH

As mentioned in the previous Annual Report, the Committee's Jute Agricultural Research Institute was transferred from Dacca to Hooghly towards the end of 1947 and from the beginning of the year under report a new Jute Agricultural Research Institute was set up in a nuclear form in a rented house at Hooghly, West Bengal, with a 50 acre farm at Chinsurah provided by the Govrnment of West Bengal. The whole organisation and research work had to start afresh. The task ahead of organising and starting the research work in a new place was difficult and a number of impediments and obstacles had to be overcome. Inspite of the difficulties of securing equipment, apparatus and proper personnel, the progress made during the short period of the existence of the new Laboratories under the able guidance of Dr. B. C. Kundu Director, Jute Agricultural Research Institute, is indeed remarkable.

The great handicap is developing the Jute Agricultural Research Institute is the absence of a permanent farm or a plot of land for the Laboratories and buildings of the Institute. The Government of West Bengal, at the personal request of Sardar Datar Singh has promised to secure, free of cost, about 150 acres of land in the vicinity of Calcutta for the Jute Agricultural Research Institute and Seed Multiplication Farm. Alternative sites have been suggested—one near Barrackpore

appears to be the best arrangement for the purpose intended. It is expected that the Government of West Bengal will afford all necessary facilities for the land, especially when the Government of India will be prepared to spend about 10 lakhs for the buildings and laboratories of the Jute Agricultural Research Institute. It is hoped that the question of the site will be settled soon. Mr. H. P. Chatterjee, M.L.A., West Bengal and member of the Indian Central Jute Committee has also been taking personal interest in the matter.

The important items of work carried out in the new Laboratories and the results obtained are briefly summarised below:—

Season.

The season on the whole was favourable for the jute crop. Sowing was started during the fourth week of April and completed by the third week of May. Germination was satisfactory in all the trials and seed plots except in some plots that were sown with old seeds available to us. Helped by alternate rain and sunshine timely intercultures were given to the plots and as a result, development of the jute plants showed promise of a very good crop. Except sporadic cases of stem-rot and heavy damage in some trials by *Anomis sabulifera and Hemitarsonemus latus*, incidence of diseases and insect pests was on the whole not much.

A cyclonic weather that continued for some days during the last week of September and early part of October did considerable damage to the seed plots. Much seed was lost in the field before collection.

Immense difficulties were experienced for want of a properly equipped farm with necessary facilities for work.

Collection of types.

In all 688 district types of jute, including 121 fresh collections made during survey tour of the provinces, were grown during the season. 289 types failed to germinate. Seeds of 5 wild species of *Corchorus* were collected. A composition study of the individual types was made, the

variabilities noted and a large number of selections representing different characters made.

Breeding of Improved jute.

12 breeding trials were carried out during the season and 7,291 selections were made for yield, earliness and other desirable characters in these trials and types mentioned above.

One local type named Deshimara, collected from Darrang, Assam, proved superior to D.154 in yield by 19.5% yielding about 30 mds. of fibre per acre. In the first year test of selections one culture C47Nj-279 was superior to the control (D.154) by 14.6%.

Besides a large number of cultures that were as good as the control, (D.154) in yield, but possessing such desirable characters as earliness, non-branching habit, resistance to stem-rot, etc., were obtained.

Seeds obtained from the multiplication plots of the improved strains were sufficient to plan the proposed, 54 subvention trials for Bengal, Bihar, Assam and Orissa that would be carried out during 1949.

As a result of treatment of a large number of seeds with colchicine polyploid plants of both *capsularis* and *olitorius* were obtained. 24 interspecific crosses between polyploids of the two species were attempted with 10 successes.

First generation interspecific vegetative grafts between *capsularis* and *olitorius* were made. Seeds were collected from scions of 26 such grafts.

Inheritance of characters.

69 genetic strains were sown in duplicate plots. All except 5 strains failed to germinate. A comprehensive selection representing the different characters observed was made in the type plots.

Isolation of certain genotypes was taken on hand and necessary crosses were obtained for this purpose.

Study of the inheritance of serrated petal character in jute was undertaken and crosses between serrated and ordinary petal types were obtained.

Olitorius types with intensely blotched leaf were isolated. The *capsularis* strain with pods in clusters of more than three failed to germinate. Isolation of cluster types from materials in purification will be made.

Anatomical any Cytological investigations.

A study of the gradual differentiation of the fibre cells of jute was undertaken and necessary materials collected for this purpose. Comparative embryological study of *C.capsularis* and *C.olitorius* was in progress. Polyembryony was observed in jute with chromosome numbers 7 and 14.

Attempts were made to induce mutations in jute and other fibre plants with different chemicals and commercial preparations. Gammaxene induced polyploids in jute.

Study of chromosome numbers in all wild jute types was taken on hand. Cytological study of colchicine treated jute plants was undertaken.

Study of the physical features and colour reactions of the various fibres to different chemicals and stains was undertaken, with a view to standardise a method for identification of vegetable fibres.

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Cultivation.

To study the possibilities of sowing jute in lines *capsularis* and *olitorius* trials carried out under Chinsurah conditions proved that sowing jute in lines was much more economical and profitable than sowing broadcast. In the *capsularis* trial all line sown plots were significantly superior to the broadcast plot in yield of fibre.

Four manurial trials were carried out during the season. In the first set of two trials with *capsularis* and *olitorius* the effect of Ammonium Sulphate and Muriate potash at three levels and combinations thereof as against F. Y. M. at 100 mds. per acre was tried, N played the most important role so far as its effect on yield of fibre was concerned.

In the second set of two trials with *capsularis* and *olitorius*, sludge, town compost and F. Y. M. at two levels and combinations of sludge and town compost with Ammonium sulphate and Muriate of potash were tried. In both the trials town compost proved better than sludge or F. Y. M. alone. Higher level of town compost and combinations of sludge and town compost with fertilizers were as good as single dose of town compost.

A replicated *capsularis* trial was carried out to study the effect of strand on the quality of jute fibre. The actual strand obtained per plot was much below the desired strand and the spacings were wider for the respective treatments. The crop was, however, harvested and fibre obtained, as scheduled, for results of comparative value that could be obtained from such a trial. The yield data were analysed and quality tests fibres are now in progress.

To study the effect of different seed rates on yield of seeds, one *capsularis* and one *olitorius* trial were carried out. The results indicated that seed rates as low as 4 lbs. per acre for *capsularis* and 2 lbs. per acre for *olitorius* could be adopted for the purpose of multiplication without appreciable loss in yield of seeds.

A preliminary trial with *capsularis* was carried out to study the yield of seed in manured and unmanured plots. Difference in yield of seed obtained from manured and unmanured plots was highly significant.

Double and triple cropping of jute land under Chinsurah conditions were tried in a *capsularis* trial in the low land and in two preliminary trial plots of *olitorius* on the high land. Results obtained, however, indicate that paddy can be grown profitably after *capsularis* and *olitorius* jute.

As a result of our propaganda cultivators, even in an *olitorius* district like Hooghly, practised double cropping of jute land on a fairly large scale with success.

Soil and biochemical studies.

The work of the Chemical Section could not be started for want of laboratory facilities. The Assistant Chemist was not appointed during the year. The Biochemical Assistant and the Junior Assistant, who were appointed in May, carried on some work on soil analysis at the Chemical Laboratory of the Presidency College, Calcutta.

Ninety six samples of soil were collected from a plot of land that was selected for double cropping with jute and paddy. N_2 and P_2O_5 were determined for 46 samples; no conclusion can be drawn at this stage.

Diseases.

The problem of proper storage of seeds was studied. It was found that moisture content had important bearing on storage. Further study is in progress. Three fungi were isolated from stored seeds of which one is *Macrophomina Phaseoli* and the other two awaits identification.

Incidence of various diseases in the field crop was recorded, and the pathogens were isolated for the study of their biology.

Special stress was laid on the study of methods for control of diseases. It was found that potash had positive effects in controlling the incidence of disease. Seed treatment with organo-mercuric dusts was found very effective. Perenox, lime-sulphur and copper-lime (0.6% copper) were found to inhibit germination of pycnospores at certain concentrations. Selection of resistant types were in progress. 174 cultures have been put in trial.

SUBSTITUTE FIBRES.

The substitute fibres section was started with the appointment of an Assistant Botanist on 1st June, 1948 in the Jute Agricultural Research Institute, Hooghly. A scheme of work was soon drawn up and investigations on various fibre crops other than Jute and Cotton were started. A brief account of

the progress made during the year 1948-49 with respect to the various items involved in the scheme is given below:—

Collection of seeds, suckers, and bulbils of various fibre yielding plants.

With a view to building up a stock of material to work upon, attempts were made to get seeds, suckers, bulbils, as the case may be, from a number of parties and Institutions within the Indian Union as well as from some of the overseas countries. Collection was also made by the staff of the Jute Agricultural Research Institute.

Seeds and other propagating materials of the following different fibre plants were collected:—*Abroma augusta*, *Abutilon spp*, *Agava sp*, *Boehmeria nivea*, *Crotalaria spp*, *Hibiscus spp*, *Linum usitatissimum*, *Malachra sp*, *Sesbania sp*, *Sida sp* and *Urena lobata*.

Except for growing them in small plots for observation and multiplication of seeds, the seeds collected of these various fibre plants was not sufficient enough for any trial on a field scale. Enough seeds of *Hibiscus sabdariffa* var *altissima* were however available and an agronomic trial on a big scale was conducted with a view to assess the real value of this fibre with regard to yield, quality and utility as also to adjudge the economics of its cultivation in comparison with jute.

Observations.

Small observation plots of *Urena lobata*, *Sida rhombifolia* *Abroma augusta*, *Crotalaria juncea*, *Hibiscus sabdariffa* var. *altissima*, and Ramie were grown, and the botanical characteristics and the peculiarities of growth and developmental phases of them were observed and recorded.

Two types of heavy yielding Kharif Sunnhemp were grown in the Rabi season to study their behaviour under conditions of low temperature in winter. The plants produced branches copiously and flowered early. The pods formed early did not

per sist on the plant but were shed without any seeds formed insic le them. Innumerable pods formed later when the temperat ure was a bit higher and all of them produced good seeds and s urvived till harvest in April. From the point of seeds produc tion this observation appeared to be very interesting.

Agronomic and breeding trials.

A co mplex cultural experiment of the factorial model was conducted for determining the effect of different method of sowing, vai ying spacings between the plants and different stages of ha rvest in various combinations on yield and quality of fibre of *H. biscus sabdariffa* var *altissima* and the economics of its cultivati on.

Results sho w that with regard to yield, broadcast method proved significa ntly superior to line sowings. From point of significance, the y ield of fibre between plants harvested at flower and pod stages w ere the same in amount but both were higher to that of these ha rvested at bud stage. Quality tests shows that the plants har vested at bud stage yield fibres of better quality.

The retting of *A. tissima plants* took a considerably long time (36 days and ove r) due to the fall in temperature of the retting water in which the plants were steeped after harvest in early winter. Lack of uniformity in the retting of the entire length of the plants was also observed which however could be improved to some extent by differential retting of the basal and the upper part, the former getting a 7 days longer treatment in advance.

10 pigmented plants have been selected from a green *Altissima* plot for future study.

Comparative trial of two dual purpose linseed obtained from Kanpur and Delhi was conducted in the Rabi season on a paired plot model, under irrigation from the farm tube well.

The seed and straw yields were significantly the same in both these samples. The purchase of breaking and scutching

appliances is necessary for dealing with the straw in the process of extracting good fibres from it.

Ramie.

A new plantation of Ramie has been set up with suckers from an old plantation and with some brought from Assam. The local method of extracting fibre from Ramie canes, as practiced in Assam, was tried with some canes harvested from an old plantation at the Chinsurah farm, but the result was not satisfactory. Good fibres can only be obtained by machine decortication of the canes followed by a chemical process of degumming. Work on these lines will be undertaken after a decorticating machine is obtained.

Hard fibres.

Practically no headway could be made to set up a plantation of fibre plants belonging to the hard structural fibre group of which Agava is the most important member, for want of sufficient propagating material.

Seed Multiplication.

Seed plots were sown for the multiplication of seeds of the different fibre plants collected in the season from different sources for experimental use next year.

Anatomical and cytological.

The study of the growth and development of fibres in the different fibre plants was undertaken. The distinguishing features of their Anatomy regarding the outline and the aggregation of the fibre bundles and the dimensional features of the ultimate fibre cells have been recorded.

Cytological studies on the root tips of some of the various fibre plants with a view to study their respective chromosomal characteristics were undertaken. The number of chromosomes were counted in some:—*Abroma* (2n)—20; *Sida* (2n)—28; *Urena* (2n)—28; Ramie (2n)—28; Mesta (2n)—36; and Roselle (2n)—72.

Treatment of seeds.

A study of the effect of colchicine and gammaxene on the production of polyploids was undertaken. In *Urena lobata* a tetraploid (4n-56) has been produced. Its survival value and morphological characteristics will be studied next year.

A study on the effect of treating seeds of *Sida*, *Urena*, *Abroma* and *Hibiscus* spp. with concentrated H_2SO_4 for varying periods of time ranging from ten minutes to one hour, on the speed of germination and subsequent growth of the plants, showed that, in general treated seeds germinated more quickly than untreated seeds.

Diseases.

Incidence of diseases on various fibre crops under-investigation other than jute, was recorded. *Phoma sabdariffa* and *Cercospora hibiscae* on *Hibiscus sabdariffa* var *altissima*, *Uromyces sp* on *Crotalaria juncea* and *Fusarium* on *Urena lobata* were found to occur as parasites.

Study on the biology of these fungi and inoculation experiments are in progress.

Pests.

Phenacoccus hirsutus has been recorded as a major pest on *Hibiscus sabdariffa* var. *atltissima*. The pest causes stuntedness of the crop and are ultimately responsible for appreciable decrease in the yield of fibre and seed.

Laboratory study on its chemical and biological control has been undertaken. An effective predator has been found out for trial as biological control.

Spermophagus tessellatus was noted on stored seeds of *Hibiscus cannabinus*. The pest can be controlled by ½ BHC treatment.

TECHNOLOGICAL RESEARCH ON JUTE.

The work of the Technological Research Laboratories has been going on satisfactorily according to programme under the guidance of Mr. C. R. Nodder, M.A. (Cantab), C.B.E., Director, Technological Research Laboratories. The more important items of Research work are summarised below :—

I. BACKGROUND RESEARCH.

1. Tensile strength of twisted bundles of fibre-strands.

The tensile strength of bundles of standard length and weight, made up from lightly combed fibre and given a standard twist, has been found to be highly correlated with the strength of standard 10 lb. yarns spun from similar fibre. An S-twist applied to the bundles was found to give a higher bundle strength than Z-twist and the correlation with yarn quality ratio was also higher when S-twist was used. Using ten jute samples of a wide range of quality a coefficient of correlation of 0.969 between bundle strength and yarn quality ratio was found. The tensile strength of twisted fibre bundles promises, therefore, to be a very useful criterion of spinning quality. In the bundles a fair proportion of the strands are not gripped at both clamps and this is a factor which, by making the conditions more like those in a yarn than when all strands are gripped out both ends, may be expected to favour correlation between bundle strength and yarn strength.

2. Bundle Torsional Rigidity.

The bundles used in the foregoing tests were also used for the determination of bundle torsional rigidity. When S-twist was initially inserted the rigidity was somewhat lower than when Z-twist was inserted, though the difference appears to be too small to be of much practical importance. The insertion of Z-twist tightens up the fibrils in the ultimates and this is presumably the cause of the observed higher rigidity. The multiple correlation coefficient for bundle strength and bundle rigidity against yarn quality ratio was scarcely higher than the correlation coefficient for bundle strength alone against yarn quality ratio.

3. Fineness of Strands in Yarns.

A new method for estimating the average fineness of the strands in a yarn (or silver or rove) has been worked out. Results agree with those calculated from the strand dimensions and the density of the cell-wall substance.

The importance of strand fineness and strand complexity (branching and meshiness) are discussed in the detailed report on the Technological Research Scheme. Simplicity in form (lowest possible amount of branching or meshiness) may to some extent outweigh mere fineness.

4. Prediction of Spinning Quality from Fibre Characters.

Using 30 samples of white jute and nine fibre characters a multiple correlation co-efficient of 0.961 against yarn quality ratio and 0.910 against yarn Wt.C.V. has been found. The 8th order partial correlation coefficients have now been calculated and the ballistic work of rupture and bundle torsional rigidity stand out as important characters for the prediction of spinning quality.

In the detailed report a table is given showing how the observed and calculated values of Q.R. and Wt.C.V. correspond in the 30 samples examined.

5. Frictional Characters of the Fibre.

Interesting results have been obtained in experiments in which a block covered with a pad of fibre is allowed to slip on an inclined plane, also covered with the fibre. It appears that the batching oil does not reduce inter-strand friction and it is probable that its main use is to reduce friction between the fibre-strands and the pins and to soften the fibre. Increase in the humidity of the fibre was found to have a pronounced effect in increasing interstrand friction. The addition of paraffin wax to be fibre reduced the coefficient of interstrand friction as measured by this method. Tossa jute tends to have a lower-coefficient of friction than white jute, in spite of its generally lower fat and wax content.

6. Effect of batching oil on yarn strength.

When jute yarns (ten different samples) were soaked in batching oil an average increase in strength of about 5% was observed. Any effect the oil may have in reducing inter-strand friction is clearly outweighed by other effects,

Increase in the amount of batching oil in the batching emulsion was found to cause greater losses in strength and weight on exposure to light and air. The emulsions used in the tests had oil contents designed to put 2, 3, 5 and 7 per cent of oil on the fibre. The initial yarn quality ratio were more or less what would be expected when it is remembered that oil adds to the grist without materially adding, for the proportions usually applied in batching to the strength.

7. Other Work.

Further studies of the creep properties and torsional rigidity of single Jute filaments have been made.

II. ROUTINE SPINNING TRIALS.

1. Raw Jute from the Indian Union.

A number of 1947 crop samples from North Bengal and Assam were spun to standard 10 lb. yarns. Only one sample out of eleven was judged suitable for spinning alone to hessian warp. This came from Dhubri. Other samples were judged suitable for hessian weft or sacking warp, or for use as part of a hessian mix.

2. J. A. R. L. Samples.

Only a few of the 1948 crop samples arrived in time for spinning during the year under review.

3. Madras Samples.

Twenty-five samples were received, representing trials arranged in 1948 by the Director, J. A. R. Three samples were large enough for standard pins and gave yarns indicating that the fibre was generally of good 'district' quality, though the yarns were rather irregular. The other samples, with two or three exceptions, were very short and some were over-ripe, badly retted, tangled or very faulty.

III. SPECIAL SPINNING TRIALS.

1. Blending Experiments.

Generally the quality ratio of 10 lb. yarns from binary blends agrees within five units with what would be expected,

on a simple mixture rule, from the proportions and quality of the ingredients.

In some experiments the curve obtained by plotting yarn quality ratio (vertically) against percentage of better quality ingredient (horizontally) was sigmoid in shape. The inflexion (steepest part of the curve) was at somewhere between 25 and 75% of the better quality ingredient.

Thorough blending at the breaker card seems likely to give better results than blending slivers at the back of the finisher card. Since blending is never perfect there may be a tendency, particularly when the ingredients differ greatly in quality, for the blended yarn to have a strength below that expected from the simple mixture rule.

On the other hand since coarse stiff strands tend to give yarns of low strength (due partly to deficiency of inter-strand contacts) the incorporation of a finer and softer ingredient may sometimes improve the yarn quality by filling in the gaps, as it were.

2. Variation in Batching Procedure.

Comparative trials were made in which (*a*) the amount of emulsion added in batching was varied (10, 20, 30 per cent) and (*b*) the amount of oil in the emulsion was varied (so as to put 2, 3, 5 and 7% of oil on the fibre) when 27% of emulsion was taken up.

The results indicate that the spinning performance is not very sensitive to such variations in batching. Even 2% of oil, provided it is evenly applied, appears to give good results. The amount of water that should be used is also not very critical, though in practice it is largely determined by (*a*) rate of evaporation during processing and (*b*) the quantity necessary to reduce dust formation. Under suitable circumstances only 10% of added water can give quite good results, but in dry weather this amount may be inadequate.

3. Fine Yarns

Results of spinning several qualities of white and tossa jute to 10 lb. and 3 lb. grist are tabulated in the detailed

report. It appears that performance at 3 lb. grist can be judged moderately well from the results obtained at 10 lb. grist, though fineness and freedom from faults are of greater importance when the finer yarns are to be spun.

The best qualities of white jute seem to be quite as suitable as the best qualities of tossa for spinning 3 lb. yarns.

IV. TESTS ON COMMERCIAL YARNS.

Fifty-two samples of sacking weft yarns from Calcutta mills were tested for grist, strength and Wt. C. V. The results show a great variation in quality. A grading scheme, based on the results, has been put forward.

As an example of the variation it may be noted that, for yarns of 30 to 40 grist, the Q. R. ranged between 41 and 66 (average 51.4) and the Wt. C. V. between 26 and 39 (average 32) on 29 samples.

V. JUTE SUBSTITUTES.

A report summarising the technical data obtained in Technological Research Laboratories has been prepared. Mesta fibre (*H. cannabinus*), also known as Bimli jute, Ambari, Kenaf, gambo, Deccan hemp, etc., appears to be the substitute that could be most readily developed in India. Eight different samples gave 10 lb. yarns with Q.R.'s ranging from 72 to 85 (average about 80). Only the very best qualities are suitable for spinning alone to hessian weft but it is quite suitable for mixing with jute for hessian warp or hessian weft yarns. Urena and roselle fibre are generally very similar in quality to mesta, but large scale development in India would take longer.

Results recently obtained with roselle fibre (*H. sabdariffa*, var. *altissima*) show that a close crop-stand and early harvesting are important for good quality.

Good 10 lb. yarns have been obtained from blends of linseed flax fibre and jute. The flax was batched with oil only and blending was done at the finisher.

VI. JUTE CHEMISTRY.

1. Bleaching

A paper describing some of the results obtained in chlorite bleaching was published (J. T. I., August, 1948).

Experiments have been made on the bleaching of jute with hydrogen peroxide and the results indicate that this is a bleaching agent that is quite suitable for jute bleaching, though loss in wet strength is still a problem.

By using a mild chlorite or hypochlorite treatment followed by a peroxide treatment (about half volume strength) it appears possible to obtain a moderately good colour of moderate permanence in storage, but full data regarding colour changes in storage are not yet available.

2. Hemicelluloses.

Progress has been made in the elucidation of the constitution of the hemicelluloses of the jute fibre. Two fractions, differing in solubility in 50% alcohol, have been obtained. The less soluble fraction contains xylose-uronic acid complexes and the more soluble fraction may consist largely of mannose residues.

3. Hemicelluloses and rot-proofing.

Some success has been obtained in treatments which aim at replacing the groups combined with the acid constituents of the hemicelluloses in the raw fibre by copper. Some one per cent. of copper can be thus introduced and it is not easily leached out. Over half the original strength was retained by yarns so treated after three months' burial in the soil, whereas untreated yarns had completely perished. Some 0.5 to 0.8 per cent. of copper remained after three and two months' burial respectively.

VII. MISCELLANEOUS WORK.

1. Waste in spinning.

From data recorded in Technological Research Laboratories for the waste collecting below the cards and reasonable assump-

tions for other losses a scheme was arrived at for processing gains or losses as between the raw fibre and the finished goods. This needs supplementing by mill data and comments and further information have been invited.

2. Sugar Bags.

In some further trials it was found that the application of 0.5 per cent. of pentachlorophenol to the cloth delayed syrup formation by about one month when sugar was stored in jute bags in a damp atmosphere.

3. Deterioration of jute on exposure and in soil burial.

Exploratory experiments have been carried out to study the effect of natural fats and waxes and of batching oil on deterioration.

In order that the results of researches achieved in the Technological Research Laboratories may be utilised by the Jute Mills industry, 18 Leaflets, containing the results considered to be of practical importance to the mills, have been prepared for distribution to the mills.

In order to develop and encourage further researches the Indian Central Jute Committee deputed one of its Senior Scientific Officers—Dr. P. B. Sarkar, D.Sc., F.N.I.—to study the special technological researches on jute and its utilisation in the United Kingdom and U. S. A. The experience and knowledge gained by him has helped the Committee to order for special types of apparatus for further researches on the technology of jute.

ECONOMIC RESEARCH.

Mr. K. C. Basak, B.A. (Cantab), Director, Economic Research is in charge of this branch. During the year under report many useful economic investigations were carried out and the more important among them are briefly summarised below :—

(i) Investigation into the Economics of jute growing.

The investigation was carried out in five centres—two in West Bengal, one in Bihar, one in Assam and one in Orissa.

The following are the important conclusions drawn from the data collected during the year :—

(*a*) Human labour accounted for about 85% of the total operational cost and cattle labour for another 11%. Therefore availability of labour is a very important consideration for the extension of jute cultivation.

(*b*) Weeding is the most important operation for jute, which accounted for 40% of the total human labour spent. Cost of production of jute can be considerably reduced by the introduction of mechanical device for weeding.

(*c*) Of the total human labour employed in jute cultivation, 45% was hired labour.

(*d*) Cost of production of jute showed wide variation from centre to centre and the main reasons for such variations were (1) difference in wage rates at different centres, (2) difference in yield and (3) difference in the input of labour, both human and cattle.

The weighted average figure of the cost of production for all the five centres, showed a small margin of profit.

(*ii*) *Study of Moffussil Prices of jute and other Statistics.*

This study has revealed that transactions in villages and primary markets particularly in Ruphoi (Assam), Belakoba (West Bengal) and Purnea (Gulabbagh) centres practically came to a close by the middle of February 1949. Secondary markets showed decline from middle of March 1949.

(*iii*) *Jute Substitutes.*

A large volume of information on substitutes has been collected during the year and detailed study is in progress. The preliminary study has revealed that the competition is the result of a number of factors, such as price, supply position, national self-sufficiency, and technical changes and legal restrictions in the methods of packaging goods.

The recent report of the possibility of growing "Kenaf" on a large scale in Cuba and El Salvador has been examined and from the results of experiments carried out in Cuba it appears that the large scale cultivation of "Kenaf" will present the following difficulties :—

(*a*) Retting and handstripping of the fibre is uneconomical due to high labour costs;

(*b*) Experiments on mechanical decortication and machanisation of harvesting have shown that the fibre produced is not equal to jute in quality for spinning and the quality of the decorticated fibre is also different from the quality of a retted hand stripped fibre, and

(*c*) The decorticated fibre slows down spinning, is dirtier and results in a weaker fibre than jute.

(*iv*) *Statistical analysis of data on physiology of Jute.*

The data of the experiments carried out by Dr. J. C. Sen Gupta on the physiology of jute plant for the year 1946-47 and 1947-48 were statistically analysed and the following are some of the conclusions arrived at :—

(*a*) Early sowing affords longer vegetative periods for the plants, while late sowing shortens the vegetative periods and increases the mortality of the plants. Sowings of *C. Copsularis* at the end of March and of *C. olitorius* in the middle of April allow full scope for the development of the plant.

(*b*) In regard to the effect of Nitrogen supplied as Ammonium and as Nitrate, Nitrogen as Ammonium is on the whole found to be the better of the two in promoting growth.

(*c*) On the effect of 3 levels of Nitrogen, Potassium, Phosphorus and Calcium it is found that of the three, Nitrogen is the most important element for promoting growth and a sufficient quantity of Nitrogen is required for the proper development of

jute plants. Deficiency in Nitrogen results in stunted growth and delay in maturity.

(v) Revision of Marketing Reports.

revision of the Report on the marketing of jute and ducts (second marketing Report) has almost been d and nearly all the tables contained in that brought te. The revised edition is expected to be brought

(vi) Survey of Jute Transport.

omprehensive survey of the position of jute transport ertaken at the instance of the Government of India port analysing the difficulties in jute transport in the provinces was prepared. Suggestion for improving sport difficulties were indicated in that report. The revealed that the difficulties were not so much due to ortage of freight space as it was for other factors, the portant of which was the seasonal and regional bution of space. It was found out that the tightness of pace in Indian Railways was due to the fact that a mber of wagons belonging to the E. I., O. T. and ailways were held up by the E. B. Railway.

(vii) Ad hoc enquiries.

mber of *ad hoc* enquiries were attended to and the portant amongst them were:

Information regarding the position of pucca Jute Baling Industry in West Bengal and Eastern Pakistan was collected and furnished to the Government of India.

A brief note on the present position of the Jute College Industry in India was prepared and forwarded to the All India College Industry Board set up by the Government of India.

(*c*) The question of fixing the parity price for U. P. jute was examined and a note on the subject was sent to the Government Director of Agriculture, U. P.

(*d*) A note on the waste lands of Murshidabad and possibilities of growing jute on them was prepared.

(*e*) A questionnaire issued by the School of Economics, Botany in connection with the Enquiry undertaken by it into Economic consequences of partition, was attended to and detailed information on quality, price and transport of jute, as well as capacity of Chittagong Port, number of pucca bailing presses in East Bengal etc., was furnished.

PUBLICITY.

The work of this Section was carried on satisfactorily according to programme during the year. The 'Jute Bulletin' continued to maintain its popularity and demand. The foreign and inland presses have made copious extracts of the important items of information appearing in the Journal.

A large number of *press notes* on various subjects bearing on jute and the activities of the Committee were issued and the Press response was very satisfactory. The more important communiques were also broadcast by the Calcutta Centre of the All-India Radio.

The Jute Museum has been further developed. A number of new pictorial charts have been added to the collections and many new samples of jute speciality products have been obtained and displayed.

ACKNOWLEDGEMENT.

Secretary is grateful to the President, Sardar Datar Singh, Vice-Chairman, Indian Council of Agricultural Research and

Additional Secretary to the Government of India, Ministry of Agriculture and to the Vice-President, Mr. I. G. Kennedy, C.B.E. for the valuable advice and guidance received from them.

I must also acknowledge the sympathy and consideration of the members of the Local Sub-Committee, more particularly of Mr. K. D. Jalan, whose healthy caution and criticism I and the Directors of the various Sections have highly appreciated.

The Secretary also conveys his thanks to the Sectional Heads, research workers and all members of the staff of the different Sections of the Committee, from lowliest to the highest with whose co-operation, hard work and devotion to duty the administration has run smoothly and peacefully during the year under report.



J. V. LAKHANI,

Secretary.

APPENDIX I

ANNUAL REPORT OF THE JUTE AGRICULTURAL RESEARCH INSTITUTE (1948–49)

INTRODUCTION

The present report is an account of the progress of the activities of the Jute Agricultural Research Institute for the first year since the Institute was set up in the Indian Union after partition of India. During the period under report satisfactory progress was made in fitting up the laboratories in a rented house at Hooghly and inspite of various difficulties all field works were carried out according to plan in the land given to us for our use by the West Bengal Government in their farm at Chinsurah. Necessary godown facilities were arranged late in the season in a fairly big tin-shed on the G. T. Road. The godown was later shifted to a more commodious pucca house nearer to the laboratories.

Almost the whole of the area allotted to us in the Chinsurah Farm was covered by crops like sugarcane, pulses, wheat, oil seeds, etc. Preparation of land was necessarily a slow process and followed the harvest of the standing crops. Shortage of requisite labour and bullocks was another initial handicap for our work and we had to solve this problem by hiring men and bullocks from outside the Farm. The greatest difficulty was experienced in uprooting the stubbles of sugarcane that covered about 4 acres of best land in the farm. The major portion of the farm was laid out in a number of small plots for the purpose of growing paddy. The existing layout had to be changed for our purpose to get bigger, well drained plots measuring roughly one acre each.

All drains in and around the farm were silted up and choked with heavy weeds. A general trimming and scraping of the drains besides cleaning of jungles had to be done before the sowing started by the fourth week of April 1948. All these operations entailed a lot of expenditure and loss of valuable time.

Adequate retting facilities were lacking within the farm. A big old "jheel" within the area allotted to us lay silted up and overgrown with thick layers of aquatic grasses for decades. A part of it was cleared and this provided excellent retting facilities to us.

Clayey nature of the soil and thick overgrowth of weeds in most of the fields required more ploughings, ladderings and clearing of weeds before a proper tilth could be obtained suitable for growing jute.

Sufficient F. Y. M. could not be procured locally. Arrangement was made through the help of the Provincial Biochemist, Directorate of Agriculture, West Bengal for getting supplies of town sludge from Calcutta. The sludge was applied to our fields at the rate of approximately 4 tons per acre.

While the field work was pushed ahead, the work of fitting up the laboratories with proper equipments was also taken up simultaneously. Some months elapsed before the laboratory buildings were repaired and electrical fittings were completed in all the rooms. Considerable progress had already been made in procurement of furniture, stores including apparatuses, chemicals and books. It is admitted that proximity to Calcutta had been a great help in this matter, particularly in these days when materials are not available even for money. Work of the Chemical and Cytological Sections of the Institute was carried out in the laboratories of the Presidency College, Calcutta, by arrangement with the Government of West Bengal, till the staff concerned were transferred to Hooghly. Supply of gas and water would shortly be arranged.

During the period under report the staff had to undergo a lot of hardships. Due to shortage of hands all of them were overworked at a time when they were faced with acute housing and other problems, but they acquitted themselves creditably of the task of setting up the new Jute Agricultural Research Institute in the Indian Union. The work was considered to be of urgent national importance and so taken up by all maintaining a spirit of team work and close co-operation amongst themselves.

The setting up of the Institute with the farm at one place, the laboratory at another place and the godown also at another place was not at all congenial to the smooth running of its all round activities, but this was the best and the only arrangement that could be made under the circumstances. The necessity of having an Institute with our own farm, godown, well-equipped laboratories, and quarters for all the staff in one place is very keenly felt.

SEASON.

The season on the whole was favourable for jute crop. After a fairly good shower of rain sowing was started with *capsularis* trials during the fourth week of April and completed by the third week of May. Germination was satisfactory in all the trials and seed plots. Helped by alternate rain and sunshine it was possible to give intercultures in time to the earlier sown plots. Growth and development of the jute plants in these plots showed promise of a very good crop. The late sown seed plots could not be given proper weeding and mulching due to incessant rain that set in on the break of monsoon. The seed crop in such plots could not grow to proper height, but that did not interfere much with the production of seed.

Incidence of disease and insect pests was on the whole negligible except in the first sown capsularis trials that recorded fairly heavy damage by Apions at the early stage. This initial damage was compensated later by development of stout branches from the bottom portions of the stem of the jute plants in these plots.

Harvest, retting and extraction of fibre were carried out in proper time inspite of all handicaps. But transplanting of paddy after jute in the double-cropping experiments were delayed unduly due to want of bullocks at the proper time. All attempts to hire bullocks failed as the cultivators would not spare them for any price. Bullocks were later supplied by the Government Farm only after they had completed transplanting of paddy in the entire farm, when it was too late for putting paddy. We had to see our double cropping experiments get

spoiled for circumstances beyond our control. We felt the need of a properly equipped farm keenly at that time. It is immediately necessary to have a farm of our own with all the facilities for work.

A cyclonic weather that continued for some days during the last week of September and early October did considerable damage to the seed crop of C. G. and of the improved *olitorius* strains that had grown to a considerable height.

Immense difficulties were experienced in the collection of bulk and single plant seeds for want of a threshing yard and a godown on the farm. Much seed was lost in the field before collection.

BREEDING & GENETICS OF JUTE

I. Collection of Varieties and Types

In all 688 district types including 121 fresh collection made during the survey tour of the provinces and 567 types from our old collections were sown in single plots during the season. Two hundred and eighty nine types failed to germinate while in the rest of the type plots germination was poor to satisfactory.

A composition study of the individual types revealed that the range of variability in respect of the different morphological characters in most of the types was quite large while a limited few of them showed a remarkable degree of uniformity. The different characters observed were noted and a comprehensive selection made to represent them in our collection of genetic strains.

The promising types were then located on the basis of their performance, and selection for yield and earliness were concentrated in them.

Collection of wild species of Corchorus.—Five wild species of *Corchorus* viz. *C. olitorius* (wild), local and exotic, *C.acutangulus*, local and exotic, *C.fascicularis*, C.trilocularis and *C. siliquosus* were collected during the season. Seeds of four

wild species viz. *C.olitorius* (wild), *C.acutangulus*, *C.siliquosus* and *C.hirsutus* were obtained through Curator, Royal Botanic Gardens, Sibpur. *C.hirsutus* failed to germinate while others were grown successfully. The collection will be maintained for genetical and cytological investigations.

II. Breeding of Jute

Fullest advantage was taken of the materials available for breeding work. It was possible to plan and carry out 12 breeding trials during the season after sifting the materials on the basis of their performance. 123 promising selections from multiple crossing materials that could not be included in trials for limitations of seed were sown in single plots. The total number of selections made in the various trials and single plots, including the district types, for yield, earliness, non-branching habit and resistance to disease were 7291. Pigmentation, height, base diameter, habit in respect of branching and earliness were noted for individual selections and seeds of those that survived to maturity were preserved for further study.

Primary Selections—21 capsularis and 19 *olitorius* district types were grown and studied in 4 randomised layouts. 600 *capsularis* and 525 *olitorius* selections were made in these after a study of the various characters. The yield data obtained from these trials were analysed. One *capsularis* type named Deshimara obtained from Darrang, Assam, proved significantly superior to D. 154 by 19.5%, yielding about 30 mds. of fibre per acre.

The number of primary selections made in the single type plots was 458 bringing the total of primary selections made during the season to 1583.

First year test of Selections.—98 primary selections brought forward from the available material were grown and tested in 4 replicated progeny row trials. 1568 secondary selections were made in these cultures.

The yield data from these trials were analysed. One culture, C47 Nj-279, was significantly superior to D.154 by 14.6%.

Second, third and fourth year tests of Selections.—No second, third and fourth year tests of selections could be carried out during the season. The materials were all left at Dacca and at the sub-stations in East Bengal.

Fifth and Sixth year combined test of Selections.—On the basis of yield performance and earliness 8 families with 48 progenies brought forward from trials carried out at Narainganj were tested in a compact family block layout. 768 selections were made within the progenies.

On analysis of the yield data three families proved as good as D.154 in yield, but maturing about 15 days earlier than the control.

Test of Selections in multiple crossing materials.—90 selections brought forward on the basis of vigour, height, base diameter, non-branching habit and earliness performances were tested in 3 replicated progeny row trials. 2880 selections were made within the progenies after a study and scrutiny of the various desirable characters.

The yield data obtained from these trials were analysed. A large number of cultures in a progressive purification stage, proved as good as the control (D.154) in yield, but possessing some of the most desirable characters such as non-branching habit, earliness and resistance to stem-rot.

123 selections not included in trials were grown in single plots. 492 selections were made within the progenies on the basis of their performance.

Polyploidy and interspecific hybridization in jute.—Seeds of *capsularis* and *olitorius* were soaked for five different periods viz. 6, 12, 18, 24 and 36 hours in five different concentrations of Colchicine, *viz.* 0.025, 0.5, 0.1, 0.15 and 0.2% giving 25 treatments. 2,500 seeds of the two species were thus treated and sown in duplicate plots in the field and in the compound of the

laboratories. Germination was only about 1.9% giving 47 plants for our observation. 11 *capsularis* and 1 *olitorius* plants were identified as polyploids from a morphological study of the individual plants. Materials for cytological study and confirmation of these polyploids were fixed and preserved. Seeds were collected capsule-wise from all the polyploid plants for further study during the coming season. 825 such capsules were collected.

All attempts to synthesise the desirable characters in diploids of the two species—C.capsularis and C.olitorius had been made so far without success. It was, therefore, decided to try to overcome the interspecific cross incompatibility of the two species, by a combination of their polyploids when the same were obtained. For this purpose 24 crosses between polyploids of the two species were attempted with 10 success. It now remains to be seen whether the seeds obtained from the crosses germinate to give the desired hybrid.

Vegetative rapproachement as a means of overcoming interspecific cross incompatibility in Jute.—A large number of inarch and cleft grafts with *capsularis* stock and *olitorius* scion and *vice versa* were attempted. The grafts set freely, but only 26 grafts survived till maturity. Seeds were collected from these grafts for further work during the following season.

III. Inheritance of Characters

Genetic strains.—114 selections from 69 strains available to us were sown in duplicate plots in the field and in the compound of the Laboratories. Only 5 strains germinated leaving us with the difficult task of building up the collection again. All attempts to germinate the rest of the strains after treatment with different chemicals and commercial powders failed. Twenty three selections were obtained from the surviving strains and retained for study.

As stated earlier, a comprehensive selection from the type plots, representing the different characters observed, was added to the list above. The whole lot of selections would be grown in a purification series during the coming season.

Isolation of genotypes.—With the loss of the most of the genetic strains the full green genotypes except ccAARR represented by Dhaleswar were also lost to us. Crosses between Dhaleswar and three members of the red group were obtained to isolate five full green genotypes, *viz.* ccAArr, ccA^{L} A^{L} RR, ccA^{L} A^{L} rr, ccA^{R}A^{R}RR and ccA^{R}A^{R}rr. Isolation of the seventh member of the group *viz.* cc aa RR will be taken up when the green-light coppery red type, CC aa RR is located.

The process of isolation of the genetic strains will be continued till the original list of them is brought up-to-date and fresh materials will be added to the old list as new characters are observed.

Serrated petal.—Usually the margin of a petal in jute is entire. In a certain *olitorius* type it was observed that the petal was serrated at the tip, the degree of serration varying from flower to flower on the same plant. Crosses between the ordinary and the serrated petal type were obtained for studying inheritance of this character.

Blotched leaf.—Olitorius types with intensely blotched leaf were isolated.

Cluster-pod habit.—The established *capsularis* strains with pods in clusters of more than three failed to germinate. Fresh materials for study of this character will be isolated from the types in purification series.

IV. Subvention Trials

Seeds obtained from the multiplication plots of the improved *capsulris* and *olitorius* strains were sufficient to plan the proposed numbers of subvention trials for 1949-50 in the four provinces distributed as follows:—

Province		No. of trials Capsularis	Olitorius	Total
West Bengal	...	8	12	20
Bihar	...	7	5	12
Assam	...	9	3	12
Orissa	...	7	3	10
		31	23	54

The following strains were included in these trials:—

Capsularis: C39-212, C41-13, C42Kj-321

Olitorius : O39-620, O40-632, O40-753

Of the *capsularis* strains C42Kj-321 was put for the first time in a subvention trial replacing C42Nj-412 which was reported from many places to be susceptible to stem-rot though a quick growing, early and high yielding strain. The new strain is recommended for its fairly high yield, earliness and superior quality of fibre confirmed by technological tests.

The *olitorius* strains are tested high yielders and are released for tests in cultivators plots for the first time.

It is hoped that the subvention trials will serve the double purpose of testing our improved strains under a varying conditions of soil and climate and of demonstration to the local growers of jute the utility of growing improved strains.

ANATOMICAL AND CYTOLOGICAL INVESTIGATIONS.

As indicated earlier much progress could not be made in anatomical and cytological investigations due to lack of proper laboratory facilities.

Anatomical.—A study of the gradual differentiation of the fibre cells in *C.capsularis* and *C.olitorius* was undertaken and growing apices of the stem and the inflorescences were fixed and preserved.

Internode length and its correlation with ultimate fibre length.—The studies were dropped for lack of personnel and of proper laboratory facilities. A scheme would be drawn up when necessary facilities would be available.

Cytological.—During the period from the 1st April to the 8th July 1948, the Cytological Assistant carried out some work in the Botanical Laboratories of the Presidency College, Calcutta. Sections of embryological materials of D.154 and C. G. were cut and a number of slides prepared. Later, floral

buds from colchicine treated *capsularis* and *olitorius* plants were fixed, dehydrated and preserved in Cedar Wood oil for preparation of blocks for cytological studies.

A study was undertaken by the Anatomical Assistant with some commercial preparations like Gammexane, D. D. T., Sulphanil-amide, etc. to explore the possibilities of producing polyploids and other mutations by treatment of sprouting seeds of jute. Gammexane gave positive result. It induced polyploidy and also chromosome fragmentation. The effect of chemicals like Phenol and Potassium thiocyanate in this respect, is under investigation.

Polyembryony was observed in the course of germination tests of samples of jute seeds. Cytological study of the two embryos revealed that it was a case of haploid—diploid polyembryony with 7 and 14 chromosomes respectively.

Identification of vegetable fibres.—A good number of samples of fibres obtained from different sources were received, during the year under report, for identification. It was considered necessary to standardize a method for identification, of these fibres. Good progress was made in this direction since laboratory facilities were available. A systematic study of the different fibres would be undertaken during the coming year.

CULTIVATION

(*i*) Line Sowing

To study the economics of sowing jute in lines as compared with the usual method of sowing broadcast and to test the quality of fibre as influenced by spacing between plants in lines, two trials, one *capsularis* and one *olitorius*, were carried out during the year. The treatments compared in both the trials were—light thinning × 12″, 2″ × 12″, 3″ × 12″, 4″ × 12″ and broadcast at the rate of 10 lbs. and 6 lbs. respectively per acre with usual thinning.

Technological tests of the fibres obtained from the different treatments of the two trials are in progress.

The yield data were analysed and the costs of cultivation and profit values per acre were computed for the respective treatments as shown in the table below.

TABLE I

C. Capsularis (D·154)

Treatment	Cultivation cost per acre		Yield per acre (mds.)	Profit value of fibre at 30/- per md. (at Rs.)
	Total in rupees	Percent on control		
Broadcast	300·5	100·0	22·28	367·9
Light thinning × 12″	271·0	90·2	29·43	611·9
2″ × 12″ ...	269·5	89·7	28·90	597·5
3″ × 12″ ...	265·0	88·2	27·52	560·6
4″ × 12″ ...	266·5	88·7	28·02	574·1
P ...			0·01	
C.D ...			4·51	
C. olitorius (C. G.)				
Broadcast ...	302·5	100·0	23·06	389·3
Light thinning × 12″	252·5	83·5	23·27	445·6
2″ × 12″ ...	250·3	82·7	22·77	432·0
3″ × 12″ ...	253 3	83·8	23·69	457·3
4″ × 12″ ...	254·0	83·9	23·86	461·6
P ...			Large	

In the *capsularis* trial the differences in yield of fibre between line-sown and broadcast plots are highly significant, all the line-sown plots yielding much higher than the broadcast plots. The comparatively much higher profit values for the line-sown plots are accounted for partly by the lesser cost of cultivation and to a large extent by the higher yield as compared with the control.

In the *olitorius* trial difference in yield between the various treatments and the control is insignificant. The higher profit values for line-sown plots are almost wholly accounted for by the lesser cost of cultivation.

The results obtained under Chinsurah conditions, thus confirm our findings in previous years at Dacca and the out-stations in Eastern Bengal regarding the advantages of sowing jute in lines over the usual method of sowing broadcast.

(*ii*) MANURIAL TRIALS

To study the effect of different fertilizers on the yield and quality of fibre as compared with that of different organic manures available and to find out the optimum levels of them that could be profitably applied, two sets of trials with *capsularis* and *olitorius* in randomised block layouts were carried out during the season under Chinsurah conditions.

(*a*) *Trials with Ammonium Sulphate and Muriate of Potash.*—The effect of these fertilizers was studied at three different levels and combinations thereof. Fertilizers applied and yield of fibre obtained per acre and approximate values of the produce from the respective treatments are given below separately for each trial.

TABLE II

C. capsularis (D·154)

Treatment	Yield per acre in mds.	Per cent on control	Value @ Rs. 30/- per md.
			Rs. as.
N_2K_3	31·55	171·19	946 8
N_3K_2	31·28	169·70	938 6
N_3K_3	31·07	169·54	932 2
N_3K_1	30·43	165·07	912 14
N_3	30·24	164·05	907 3
N_2K_1	30·15	163·59	904 8
N_2	30·07	163·11	902 2
N_2K_2	29·66	160·90	889 12
N_1	25·43	137·97	762 14
N_1K_1	25·24	136·96	757 3
N_1K_2	25·16	136·49	754 12
N_1K_3	24·89	135·02	746 11
F. Y. M.	18·43	100·00	552 14
K_3	17·84	96·80	535 3
K_1	17·49	94·89	524 11
K_2	15·93	86·43	477 14
C.D.	3·19		

N_1 —Ammonium sulphate @ 1·8 mds. or 30 lbs. of N. per acre.
K_1 —Muriate of Potash @ 0·6 mds. or 25 lbs. of K. per acre.
F. Y. M. 100 mds. per acre.

The differences in yield of fibre are highly significant.

(1) Double & treble doses of N and their combinations with different levels of K proved the best; but there is no significant difference between N_2 and N, with different levels of K.

(2) Single doses of N and combinations of same with different levels of K proved superior to F.Y.M. or K alone.

Finally, so far as yield of fibre is concerned N plays the most important role. The yield is considerably increased by doubling the dose of N but any higher level of application than N_2 is uneconomic as there is no appreciable increase in yield thereby. This observation confirms our results obtained at Dacca.

TABLE III

C. olitorius (*C. G.*)

Treatment	Yield per acre in mds.	Percent on control	Value @ Rs. 30/ per Md.
			Rs. As.
N_2 K_2	22·56	142·94	676 12
N_2 K_3	22·52	142·74	675 9
N_1 K_3	21·96	139·15	658 12
N_2 K_1	21·94	139·07	658 3
N_1 K_2	21·94	139·01	658 3
N_1	21·81	138·21	654 4
N_2	21 41	135·70	642 4
N_1 K_1	21·33	135·16	639 14
N_3 K_3	21·01	133·34	631 3
N_3 K_1	20·76	131·55	622 12
N_3	20·02	126·89	600 9
N_3 K_2	19·96	126·47	598 12
K_2	16·38	103·80	491 6
K_3	16·03	101·59	480 14
K_1	16·01	101·46	480 4
F.Y.M.	15·78	100·00	478 6
C. D.	3 51		

N_1—Ammonium Sulphate @ 1.8 mds. or 30 lbs. of N per acre.
K_1—Muriate of Potash @ 0·6 mds. or 25 lbs. of K per acre.
F. Y. M.—100 mds. per acre.

The differences of yield of fibre are highly significant.

Different levels of N and combinations of same with different levels of K proved significantly superior to F.Y.M. or K alone, but there is no significant difference between N, and higher levels of N or their combinations with different levels of K.

Here again N controls the yield of fibre irrespective of its combination with K, but higher levels of N are uneconomic as there is no corresponding increase in yield. This is not in conformity with the results obtained in the *capsularis* trial this year and also with previous results obtained from *capsularis* and *olitorius* trials carried out at Dacca, wherein N_2 gave a significantly higher yield over N_1.

(*b*) *Trials with Town Compost and Sludge.*—The effect of Town Compost and Sludge and F.Y.M. at two different levels as also combinations of Town Compost and Sludge with N and K in single doses was studied with *capsularis* and *olitorius* in two trials. The manures applied and yield of fibre obtained per acre are given below separately for each trials.

TABLE IV

C. capsularis (*D·154*)

Treatment	Mean yield per acre in mds.	Percent on control	Remarks
$C_1N_1K_1$ ...	31·99	180·59	
C_2 ...	31·73	179·11	
C_1N_1 ...	31·53	177·96	
C_1 ...	29·50	166·49	
S_1N_1 ...	27·58	155·66	Profits not calculated
$S_1N_1K_1$ ...	27·32	154·22	
S_2 ...	22·30	125·86	
S_1 ...	20·64	116·52	
$F.Y.M_2$ ...	19·96	112·65	
$F.Y.M_1$ ...	17·72	100·00	
C.D. ...	3·84		

C_1—Town compost @ 150 per acre.
S_1—Sludge @ 150 mds. per acre.
F. Y. M—150 mds. per acre.
N_1—Ammonium sulphate @ 1·8 mds. or 30 lbs. of N per acre.
K_1—Muriate of Potash @ 0·6 mds. or 25 lbs. of K per acre.

The differences in yield are highly significant

(1) Compost alone and in combination with N_1 & N_1K_1 is superior to both levels of sludge or F.Y.M.

(2) There is no significant difference between single dose of compost and higher level of same or same level of compost in combination with N_1 and K_1.

(3) Single dose of sludge in combination with N_1 is better than sludge or F.Y.M. alone.

Compost in single dose is therefore, the most profitable to apply for higher yield of fibres.

TABLE V

C. glitorius (C.G.)

Treatment	Mean yield per acre in mds.	Percent on control	Remarks
C_1N_1 ...	24·34	129·00	
$S_1N_1K_1$ ...	24·20	128·26	
S_1N_1 ...	24·07	127·57	
$C_1N_1K_1$ ...	23·47	124·39	
C_2 ...	23·01	121·95	Profits not calculated
C_1 ...	22·76	120·63	
S_2 ...	20·80	110·24	
S_1 ...	19·90	105·47	
F.Y.M. ...	19·00	100·00	
$F.Y.M_2$ ...	18·21	96·51	
C.D. ...	3·31		

C_1—Town compost @ 150 mds. per acre.
S_1—Sludge @ 150 mds. per acre.
F. Y. M.—150 mds. per acre.
N_1—Ammonium Sulphate @ 1·8 mds. or 90 lbs. of N per acre.
K_1—Muriate of Potash @ 0·6 mds. or 25 lbs. of K per acre.

The difference in yield of fibre is highly significant.

Single dose of compost with N_1 or single dose of sludge with N_1 K_1 is better than both levels of sludge or F.Y.M. But there is no significant difference between single dose of compost and higher level of same or single dose of compost and sludge in combination with N_1 and N_1K_1. Compost in single dose is again, the most profitable to apply for higher yield of fibre.

It may be noted that the Town Compost and the sludge were obtained through the Directorate of Agriculture, West Bengal. The two manures could not be analysed for want of Laboratory facilities nor are any data available.

(III) QUALITY OF FIBRE AT DIFFERENT STAGES OF MATURITY

To study the quality of fibre obtained from plants harvested at different stages of maturity, a bulk plot *capsularis* (D.154) was grown. The plants were harvested by selection, at 7 different stages, *viz.* (*a*) well before bud, (*b*) just before bud, (*c*) bud, (*d*) flower, (*e*) early pod, (*f*) pod and (*g*) pod ripening stages. Fibres obtained have been sent to T.R.L. for quality tests which are in progress.

(IV) CROP STAND IN RELATION TO YIELD AND QUALITY OF FIBRE

A replicated randomized *capsularis* (D154) trial was carried out with adjusted seed rates of 16.4, 7.3, 4.1, 1.8 and 0.82 pounds per acre to achieve spacings 2″ × 2″, 3″ × 3″, 4″ × 4″, 6″ × 6″ and 9″ × 9″ respectively between plants after final thinning and to study the effect of the number of plants in a plot on the yield and quality of fibre. Unfortunately, the number of plants actually obtained for the respective treatments fell far short of the theoretical stand, germination in the field depending on a number of uncontrollable factors. It was at first decided to abandon the trial, but later on the crop was harvested and fibre obtained, as scheduled, considering that results of some comparative value could be obtained from such a trial.

Stand, spacings and yield actually obtained, on per acre basis, as compared to the expected stand & spacings are given in table below:—

TABLE VI.

Expected		Actual		Yield of fibre per acre mds.	Per cent on control
Stand per acre	Spacings	Stand per acre	Spacings		
1,568,160	2″ × 2″	251,790	5·0″ × 5·0″	17·5	79·8
696,960	3″ × 3″	120,980	7·2″ × 7·2″	24·3	110·0
392,040	4″ × 4″	100,330	7·9″ × 7·9″	23·2	105·5
174,240	6″ × 6″	49,504	11 3″ × 11·3″	24 8	112·8
77,440	9″ × 9″	25,095	15·8″ × 15·8″	23·1	105·2
...	Usual at 10 lbs. seed rate.	109,550	7·6″ × 7·6″	22·0	100·2
...	...	...	P	0·05	...
...	...	...	C.D.	5·9	...

As regards yield of fibre 7.2″ × 7.2″ and 11.3″ × 11.3″ spacings were the best.

Fibres obtained from the different treatments have been sent to T.R.L. for quality tests. The results have not yet been received.

(V) EFFECT OF DATE OF SOWING ON PLANT GROWTH, FLOWERING AND FIBRE YIELD

Sowings could be taken by the fourth week of April after the land was ready. This was considered too late for the aforesaid experiment which had to be dropped for this year. A comprehensive scheme was drawn up for the following year.

(VI) SEED JUTE

To study the effect of different seed rates on yield of seed and to find out the optimum seed rate for *capsularis* and *olitorius* for the purpose of seed multiplication, two replicated trials with different seed rates, noted below, were carried out. The data on analysis yielded the following informations:—

TABLE VII.

C. Capsularis (D154)			*C. Olitorius (C. G.)*		
Seed rate per acre seers.	Yield of seed per acre. mds.	Percent on control.	Seed rate per acre seers.	Yield of seed per acre. mds.	Percent on control.
2·0 No thinning	4·50	95·7	1·0 No thinning	3·48	97·2
2·5 ,, ,,	4·50	95·7	1·5 ,, ,,	3·13	86·1
3·0 ,, ,,	4·56	97·9	2·0 ,, ,,	3·67	102·8
3·5 ,, ,,	4·90	104·2	2·5 ,, ,,	3·72	102·8
4·0 ,, ,,	4·91	104·2	3·0 ,, ,,	3·88	103·3
4·5 ,, ,,	5·19	110·6	3·0 Usual ,,	3·60	100·0
5·0 ,, ,,	5·02	106·4	P	Large	...
5·0 usual ,,	4·74	100·0	...	...	...
P.	0·01	...			
C.D.	0·59				

4.5 seers per acre for *C.capsularis* is the best 3.5, 4 and 5 seers are good while 2, 2.5 and 3 seers are poor seed rates for the purpose of seed multiplication. For *C. olitorius* higher seed rates of 1.5, 2.0, 2.5 and even 3 seers are as good as 1 seer per acre so far as their effect on yield of seed is concerned.

A replicated trial with well-manured and unmanured plots in pairs, originally laid out for the purpose of double cropping with *capsularis* jute and paddy, was ultimately retained for multiplication of jute seeds, for dearth of paddy seedlings and for want of bullocks to plough the land at the time of transplanting paddy. The seeds were collected plot-wise and weighed. The yield of seed obtained from the two treatments are given below:—

Treatments.		Yield of seed per acre.
Well-manured	...	6·86 mds.
Un-manured	...	5·78 mds.
P	...	0·01 mds.
C. D.	...	0·036 mds.

The difference in yield of seed is highly significant. The well-manured plots received F. Y. M. and fertilizers as follows:—

F.Y.M.—100 mds., Ammonium Sulphate—3 mds. and Muriate of Potash—0.6 mds. per acre.

(VII) Double and Triple Cropping of Jute Land

Cultivators in many parts of East Bengal and in a limited area elsewhere, practise double or triple cropping of jute land in suitable areas on a fairly large scale. The usual practice is to put transplanted paddy after jute, a third crop of an oil seed or a pulse usually grown for fodder, or a vegetable is also taken from the same field every year in some places. The advantages of such a system of cropping the land more than once in a year hardly needs any elaboration, particularly in the present position of the country when we need food as well as other important commodities like jute. It is, therefore, intended to introduce this system in other jute growing areas where suitable conditions exist and where the present practice is to take a single crop in the whole year. Jute is roughly a four months' crop. So, there should be no great difficulty in rotating jute with some other food crop in a one-year scheme in many places.

On the decision by the Government of India to increase the production of jute in the country without decreasing the acreage under food crop, the I.C.J.C. carried on extensive propaganda regarding growing jute as an earlier additional crop on aman paddy lands in suitable areas. The response to such a propaganda was remarkable. The cultivators even in *olitorius* districts like Hooghly practised double cropping on a fairly large scale putting paddy in their fields after jute.

To investigate the possibilities of double and triple cropping jute land under Chinsurah conditions, the J.A.R.I. in the first year of its reconstitution at Hooghly carried out preliminary trials with some success.

Results of preliminary trials carried out are as follows:—

Triple-cropping, capsularis jute-paddy-berseem in low land.—To ensure optimum yield of jute and paddy, and to study the possibilities of growing a third leguminous fodder crop in the land, a replicated randomized trial, with 3 early and 1 late *capsularis* types, was carried out in the low land of the Chinsurah Farm. The trial was sown on 2.5.48, which was rather late for such a trial and harvested on 10.8.48, just after 100 days of sowing. The results are as follows:—

TABLE VIII

Types	Growth period.	Maturity at harvest.	Average height.	Yield per acre maunds.	Per cent on control.
Fanduk	100 days.	Flower	8′ 5″	18·05	107·8
C42 Nj-412	100 ,,	Bud	8′ 5″	13·92	82·7
Hewti (Cultivators' type)	100 ,,	Pod	7′ 8″	11·56	68·7
D154	100 ,,	Bud	8′ 0″	16·82	100·0
P	.....	.....	.....	0·05	.....
C. D.	.....	.....	.....	4·01	.....

The difference in yield of fibre is significant. Fanduk, an early type that is reputed for its fibre of good quality, is the best. Hewti, a very early cultivator's type obtained from Jalpaiguri, is a poor yielder. Both Hewti and C42NJ-412 were inferior to Fanduk in yield of fibre.

Fibres have been sent for quality tests which are in progress.

Paddy was transplanted after harvest of jute on 18.8.48. Almost immediately after transplanting of paddy heavy rains set in and the crop was submerged. Some of the seedlings of course survived when the rain water receded to a lower level after about two weeks. The yield of paddy was naturally low being only about 5.2 mds. per acre. The third crop of Berseem could not be grown for want of sufficient seeds.

Triple-cropping, olitorius jute-paddy-mustard.—As a preliminary test in the first year, *olitorius* jute (C.G.) was sown in a 100′ × 50′ plot on the high land on 6th May 1948 and harvested on 19th August 1948, after 105 days when the plants were at the bud stage. The crop yielded 196 lbs. of fibre @ 20.8 mds. per acre.

There was undue delay in transplanting paddy after cutting jute due to want of bullocks. Transplanting of paddy was however managed on 30th August 1948. The crop was harvested on 6th December 1948 after 98 days from the date of transplanting, yielding 124.5 lbs. of paddy @ 13.2 mds. per acre and 150.5 lbs. of straw @ 16 mds. per acre.

Paddy was followed by mustard. Germination and growth of the crop was rather poor for want of sufficient moisture in the soil. The crop was ultimately ploughed down.

Double-cropping, Olitorius jute-berseem.—A second plot of the same size sown with *olitorius* jute (C. G.) on the same date as above and harvested after 129 days, at the small pod stage, yielded 248 lbs. of fibre @ 26.3 mds. per acre.

Two lbs. of Berseem seeds were sown on this plot on 25th November 1948. Germination was fairly good. The plot was irrigated once after germination and later on irrigated twice following the first and second cuttings. The first cutting was taken soon after appearance of flower buds, subsequently two

more cuttings were obtained giving yield of green fodder as follows:—

TABLE IX

Cuttings.		Yield of green fodder.			
		Actual.		Per acre.	
No.	Dates.	Mds.	Srs.	Mds.	Srs.
1st	2-3-49	18	12	159	8
2nd	1-4-49	11	23	100	30
3rd	2-5-49	5	10	45	27
Total 3 cuttings		35	5	305	25

Berseem is thus quite a suitable fodder crop that may follow *olitorius* jute. Besides yielding sufficient rich, green fodder, Berseem enriches the soil by fixing nitrogen in it and also controls weeds when the fields are left fallow after harvest of jute. But it is difficult to get sufficient seeds of Berseem since the plants do not seed freely in this climate. If supply of seed is ensured by import from elsewhere in India, Berseem may be grown as a useful second or third crop in the year over a large part of the jute tract.

SOIL AND BIOCHEMICAL STUDIES

The work of the Chemical Section could not be taken up for a few months at the beginning of the year under report for want of staff and laboratory facilities. Some work was however carried out at the Chemical Laboratories of the Presidency College by the Microbiological Assistant and the Junior Assistant. The Assistant Chemist was not appointed during the session.

The study of the primary nutrients like N_2, and P_2O_5 in jute soils and their utilisation by jute plants during the cultivation of jute in the season was undertaken.

The plot of the land to be investigated (*viz.* the Double Cropping experiment—Jute & Paddy) was divided into 12 blocks (1, 2, 3 etc.). Each block was again subdivided into

two plots (1A, 1B, etc.). From each of these 24 plots, soils were gathered by borer first from the surface to a depth of 6″ and then from a depth between 6″ – 12″. Samples were taken before sowing and after harvesting of jute crop. Thus altogether 96 samples were gathered.

As no arrangements could be made to find out the moisture content on the spot, the samples were packed in bottles without determining percentage of moisture and taken to the Chemical Laboratory, Presidency College, Calcutta for detailed analysis. N_2 and P_2O_5 were determined for 46 samples. No definite conclusion can be drawn at this stage.

DISEASES

I. Studies on pathology and storage of seeds

About 400 samples of jute seeds from widely different areas of the jute growing tracts of India were tested by the standard laboratory methods. Seeds grown by our Institute and by West Bengal Department of Agriculture proved to be the best with 100 per cent. germination and complete absence of seed borne pathogene, while samples obtained from farmers and dealers were mostly of inferior types. Number of samples adulterated with non-viable seeds was considerable. Germination percentages varied from 0 to 86, while percentage of diseased seeds varied from 0 to 21.

The result of this analysis and test shows the importance of and necessity for organised seed multiplication under expert supervision.

II. Viability

It is well-known that in storage seeds of different agricultural crops gradually lose viability. Jute seeds however lose the viability much more rapidly. Non-viable seeds have no value in the market and are usually used for adulteration of fresh stocks of seed. Studies were made to find out the causes leading to the rapid loss of viability of jute seeds.

Earlier it was established that moisture content was an important factor in relation to storage. Seeds with minimum moisture content remain viable for longer time. Further studies

show that seeds, which lost viability through long storage, swelled as the normal ones but there was no bursting of the seed coat. Various techniques and chemicals were tried to facilitate germination of such seeds but without success. It was found that the embryo was morphologically intact; it turned green in distilled water in presence of light after removal of the endosperm. Further investigation is in progress.

III. SEED BORNE FUNGI AND DISEASE

During the routine test of seeds, 3 fungi were isolated on artificial medium; of these, one is known to be seed borne, *viz. Macrophomina Phaseoli*. The other two are not yet identified; preliminary observations indicate that they are seed borne pathogenes.

Laboratory mark for the fungi.	Locality from which seed sample was received.	Nature of damage done to jute.	Name of the pathogene.
B_1	Contai, Midnapore.	Damping off	Not identified.
B_2	Midnapore	do	do
B_4	Purnea	Damping off, stem rot, root-rot	*Macrophomina phaseoli*.

B_1—Culture on standard P. D. A. gives brown felty growth and does not produce sclerotia or pycnidia. Similar fungus was isolated from infected seedlings from Chinsurah. Infected seedlings do not reveal sclerotia or pycnidia.

B_2—Culture on standard P.D.A. gives thin loose strands of mycelia, never matted into felt; strands prominent, running along the surface of the medium. Colour, dirty yellow with shades of buff. Loose sclerotia like bodies appear after 3 weeks: sclerotia having more compact inner cortex and loose outer zone, colour not different from mycelium. Number of sclerotia vary (3-9) in each tube; size, large.

B_4—*Macrophomina Phaseoli*, typical cultures were obtained on standard P. D. A.

IV. Diseases of the season

The following is a record of the diseases during the season :—

Corchorus capsularis

(*i*) Stem and root-rot caused by *Macrophomina phaseoli.*

(*ii*) Black-band—Caused by *Diplodia corchori.*

(*iii*) Soft-rot—Caused by *Sclerotium rolfsi.*

(*iv*) Leaf-spot—Caused by *Cercospora sp.*

(*v*) Leaf-spot—Caused by *Phyllosticta sp.*

Corchorus olitorius

(*i*) Stem-rot—Caused by *Macrophomina phaseoli.*

(*ii*) Lesion on stem—Caused by *Phom-opsis sp.*

As compared to observations at Dacca Farm death due to root-rot was much less. Stem-rot was not severe during the fourth to the eighth week stage. Destructive proportion was assumed only during harvest stage; this was confined to particular fields, where the soil is infested with *Macrophomina phaseoli.*

V. Chlorosis

Sporadic incidence of chlorosis was recorded in almost all the capsularis plots, but this did not assume any serious proportion. In order to study the causes and the nature of the disease, seeds were collected from chlorotic plants on single plant basis. Materials will be grown next season for further study.

VI. Control measures

Effect of fertilizers on the incidence of stem and root-rot.— Trials for six years at Dacca have shown that acid soils favoured infection. When acid soils are corrected by application of lime, incidence of disease falls appreciably. Moreover, potash in the form of Muriate of potash helps to resist infection but has no direct effect on yield.

The trial was repeated at Chinsurah without application of a basal dressing of lime, as the soil was reported to be not of acid type. Results confirm previous observations as to the effect of N and K in relation to disease.

TABLE X

Incidence of disease in C. capsularis

Treatment	Percent infection.
K_3	1·54
K_2	4·24
N_1K_3	4·32
K_1	4·64
N_1K_1	4·88
N_1K_2	5·90
F.Y.M.	7·12
N_2K_1	8·48
N_2K_3	9·46
N_3K_3	11·08
N_2K_2	11·30
N_3K_1	12·32
N_3K_2	13·10
N_1	13·92
N_2	15·96
N_3	18·64
C.D.	10·31

From the above table it will be seen that incidence of disease is lowest where Muriate of potash alone has been

used, and the same is highest where Ammonium Sulphate alone is used. The combinations occupy intermediate position. Results from other manurial trials and with sludge, town compost and F. Y. M. are tabled below:—

TABLE XI.

Corchorus capsularis.		Corchorus olitorius.	
Treatment.	Mean stem-rot per cent.	Treatment.	Mean stem-rot per cent.
S_2 ...	3·26	S_1 ...	5·16
$S_1N_1K_1$ ...	5·52	S_2 ...	6·24
S_1 ...	5·56	$S_1N_1K_1$ ...	6·44
S_1N_1 ...	6·24	C_1 ...	8·36
F.Y.M$_2$ ...	6·96	F.Y.M$_2$ ...	8·60
C_1 ...	7·12	F.Y.M$_1$ ...	9·86
$C_1N_1K_1$ ...	7·14	S_1N_1 ...	10·98
C_2 ...	7·92	$C_1N_1K_1$ ...	11·54
F.Y.M$_1$ ...	8·06	C_2 ...	14·02
C_1N_1 ...	9·50	C_1N_1 ...	15·54
C.D. ...	3·22	C.D. ...	3·22

VII. Selection of stem-rot resistant types

With a view to select and breed resistant types, 174 single plant selections were made from different materials of known pedigree. Morphological characters were recorded in each case. The selections will be tested in randomized replicated trials under conditions of induced infection to assess their degree of susceptibility and resistance. Selections include both *capsularis* and *olitorius* materials.

VIII. SEED TREATMENT

Agroson GN (4% mercury) gave complete control over seed borne pathogene; but this has injurious effects on the seedlings. Agroson GN (1% mercury) is now being tested. Landesan, another commercial product has given satisfactory results. Detailed data will be reported later.

IX. CHEMICAL SPRAYS AND SECONDARY INFECTION

Perenox, Lime-sulphur and copper-lime were tested against, "Pycnospores" of *Macrophomina phaseoli*. The results are tabled below.

TABLE XII

Action of chemicals on the germination of Pycnospores of Macrophomina phaseoli

Treatment	Observed after	Total number of spores observed	No. of germination	Percent germination
Lime-sulphur				
0·2%	3 hours	65	0	0
	24 hours	57	0	0
0·5%	3 hours	47	0	0
	24 hours	35	0	0
Perenox				
0·2%	3 hours	20	0	0
	24 hours	40	9	22·5
0·5%	3 hours	21	0	0
	24 hours	38	0	0
Copper-lime				
0·2%	3 hours	36	19	52·7
	24 hours	47	43	91·4
0·5%	3 hours	43	12	27·9
	24 hours	29	20	68·9
Tap-water	3 hours	36	33	91·6

0.2 percent lime-sulphur completely inhibits germination. Perenox at same strength inhibits germination but not completely. 0.5 per cent. Perenox is completely fungistatic in action. Copper-lime (16% copper) at 0.5 per cent. strength has only slight action on the germination of spores. Trials will be conducted in field scale next season.

PESTS

Normal activities of the Entomological Section, during the period under report were hampered as the Section was represented by the Junior Entomological Assistant only till late crop season when the Assistant Entomologist and the Entomological Assistant joined; since then investigations in a planned way were possible on available materials. Activities were mainly confined to the study of the biology of different pests including those of substitute fibre crops, their rearing, breeding etc. in the laboratory and investigations on chemical and biological control.

I. INCIDENT OF PEST

During the season there was severe outbreak of *Anomis subulifera and Hemitarsonemus* latus in the Chinsurah Farm and suitable measures were taken for their control.

II. NEW RECORDS OF PESTS.

The following three pests have been recorded for the first time on jute:—

(1) *Pseudococcus filamentosus* Ckll. var. *corymbatus* Gr. (Coccidae) on *capsularis* jute.

(2) *Pinnaspis* sp. (Coccidae)—(appears to be a new species). on *capsularis* jute.

(3) Thrips (yet unidentified) (Thripidae)—on *olitorius* jute.

Pseudococcus filamentosus Ckll. var. *corymbatus* Gr. The adult females and nymphs suck up the juice of the host and settle for the purpose around the nodal joints of apical region or at the junction of the petiole and the lamina. The females are apterous for the whole of their lives. Eggs are laid in batches in mealy ovisacs. The oviposition period ranges from 4—8 days. Total no. of eggs laid by the females varies from 400—1400. Eggs are chocolate brown in colour and each measures 0.29 mm.—0.33 mm. in length and 0.15 mm.—0.2 mm. in breadth.

Nymphs at different instars secrete honey and are often visited by ants. Male nymphs form cocoon made of fine waxy fibres and pass their later instars there before emergence as delicate two winged insects. Mouth parts are atrophied and the abdomen is prominent with wax filaments and the aedeagus.

Pinnaspis sp.—The pests suck the juice of the stem and capsules of the host plant.

The young nymphs, after hatching move about for about 30—48 hours and fix themselves for the rest of their lives to the host plant and draw their nourishment from there.

During the first instar the curly waxy fibres are secreted by both male and female nymphs but differentiation of sex begins with the development of scales—males develop white carinated scales while the females secrete oval scales. Females are apterous and cannot move once they are fixed. Delicate two-winged males emerge out from the carinated scales.

Hibiscus sabdariffa var. *altissima* has been recorded as an alternate host.

Grub of a beetle (Coccinellinae) has been recorded to be an effective predator on the scales.

Thrips—Infestations were confirmed to *olitorius* types only. *Capsularis* types showed definite resistance to these pests and not a single incidence on *capsularis* has been recorded.

The pests in general avoid light and remain within the folds of the apical buds and draw their nourishment from there. During feeding they macerate the leaf-tissues in between veins. When an infested bud begins to unfold, the pest moves up to the next bud and thus macerates all the buds in regular succession. Macerated tissues soon die and become prominent as white streaks in unfolded leaves.

0.5% BHC (Benzene hexachloride) has been tried with positive result.

III. Insecticidal Trials in Laboratory

1. 0.5% Y-BHC has been found to be effective against nymphs and adults of Aphids, *Tetranychus bioculatus*, *Hemitarsonemus latus*, caterpillars of *Laphygma exigua*, *Anomis sabulifera* & *Diacrisia obliqua* but ineffective against eggs of *Tetranychus bioculatus*, *Hemitarsonemus latus;* nymphs and adults of *Ferrisia virgata*. BHC also kills adults of *A. corchori*.

2. Preliminary trial with Lime-Sulphur solution against eggs of *Tetranychus bioculatus*, and *Hemitarsonemus latus* showed negative result.

3. Water-base "Guesarol" (D.D.T. 50%) and Gammexane D.034 and D.025 have been tried in replicated randomised trial against caterpillars of *D. Obliqua*. The result has been indicated in the table below:

Treatments	Mean mortality %
0.25% "Guesarol" soln.	4
0.5% ,, ,, ...	56
1% ,, ,, ...	84
1.5% ,, ,, ...	88
2.0% ,, ,, ...	88
2.5% ,, ,, ...	88
3.0% ,, ,, ...	88
3.5% ,, ,, ...	96
4.0% ,, ,, ...	96
4.5% ,, ,, ...	96
5% ,, ,, ...	100
Gamm. D.034	100
Gamm. D.025	100
Control	nil
Mean C. D.	20.5
S.E.%	7.9

SUBSTITUTE FIBRES SECTION

Introduction

As a result of the division of India together with the partition of Bengal most of the important jute growing areas have fallen in Pakistan (Eastern Bengal). As all the jute mills

are situated in India, there has been a crisis in the jute trade, as the production of Indian jute is far less than what is required for the mills.

The trend of events in this connection has, from the very beginning, been closely watched by the Indian Central Jute Committee and the Jute Agricultural Research Institute under its control. To the latter has now devolved the pressing problem of devising and execution of effective ways and means for a quick and satisfactory solution of this impasse.

When the question of division of Bengal was in the melting pot, the Director, Jute Agricultural Research Institute, took up the idea of conducting intensive investigations on various fibre crops other than jute and cotton in addition to vigorous and intensive work on jute with a view to effect an overall increase in the fibre wealth of the country including jute. Later, immediately after the partition of Bengal he impressed on the President of the Jute Committee about the importance and necessity of this line of attack on the problem. The result of this move was the creation of a separate section directly under him for carrying out investigations on various substitute fibre crops. The Substitute Fibres Section was opened with the appointment of an Assistant Botanist on the 1st. June, 1948.

The first step in tackling this problem of shortage of jute supply is the exploration of the possibilities of growing more jute in the Indian Union, without in any way causing any shrinkage of the existing areas under food crops, by growing jute in waste lands and as an ealier additional crop in aman paddy land and by intensive methods of cultivation including the introduction of superior strains of jute, improved cultural methods and plant protection measures. This has already been undertaken by the Jute Agricultural Research Institute as a result of the decision taken by the Government of India on the point and a new Development Department has been organised.

Side by side with this work, the possibilities of growing other crops, yielding bast fibres, such as, *Hibiscus cannabinus* (Mesta), *Hibiscus sabdariffa* var, *altissima* (roselle) and other species of *Hibiscuss*, Crotolaria *juncea* (Sunn hemp) and

different species of *Sida*, *Abutilon*, and *Sesbania*, dual purpose linseed, Ramie, etc. as also hard fibres like Agaves, in areas where jute cannot be profitably grown for uncongenial climatic, edaphic and economic causes, are also being studied with a view to ascertain as to how they compare economically, agriculturally and technologically with Jute and to what extent they may be utilised to supplement Jute as a substitute or utilised in mixture with it in the Jute mill machinery to make up the deficit of Jute supply in the mills and of other fibre trade in general.

Seeds of various fibre plants collected locally and obtained from outside sources were grown in the Chinsurah Farm. Although the sowing was done somewhat late in the season and on rather a poor land, yet the performance record of each of them was quite satisfactory and rather better than what was expected. It may be mentioned in this connection that most of the various kinds of fibre plants mentioned above have been found to be growing in Chinsurah and other neighbouring areas. From these observations it may be stated that Chinsurah experimental farm as also similar lands in the adjoining districts are quite suitable for growing the various fibre crops, of the like mentioned above, to perfection and also for conducting Botanical and Agronomical researches on them under the auspices of the Jute Agricultural Research Institute with its facilities of fully upto date equipments and efficient research staff. The advisability of it is further strengthened due to the fact that the Jute Agricultural Research Institute is also situated in close proximity of the Jute mills and the fully equipped Technological Research Laboratories of the Indian Central Jute Committee with which it has already been co-ordinating in respect of researches on Jute—wherein the technological aspects of these other fibre plants may be quite easily and effectively studied.

BOTANICAL AND AGRONOMICAL STUDIES

I. COLLECTION OF SEEDS, SUCKERS AND BULBILS OF VARIOUS KINDS OF FIBRE YIELDING PLANTS

In order to build up a stock of material to work upon a vigorous search for plants near about the farm and other places

were made; attempts were also made to get seeds, suckers, bulbils etc. from various sources within the Indian Union as well as from some overseas countries.

The initial work of collection of types and varieties of different fibre plants is rather a difficult and time-absorbing task. This work had to be commenced late in the season and with no other staff except the Assistant Botanist. With these handicaps a large collection could not be made. There is very much to be done in this direction. The collection work has been continued and it is hoped that by the end of next year we may make much headway in this line.

Further, it may be mentioned that the quantity of seed collected of the various kinds of fibre plants, except that of *Hibiscus sabdariffa* var. *altissima*, was not sufficient enough to conduct any experiment of the nature of an agronomic or a varietal trial on a field scale. Thus the seeds of most of these fibre plants were utilised for multiplication with a view to raise enough quantity for conducting fullfledged field trials in near future for the assessment of their respective fibre yielding capacities and their real value regarding utility and quality in comparison with jute as also to adjudge the economics of their cultivation.

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II. OBSERVATIONS

(1) A small plot of each of the following fibre plants was grown for a close study of their botanical characteristics and their growth and developmental phases:

The fibres under observation were: *Urena lobata*, *Sida rhombifolia* *Abroma augusta*, *Crotalaria juncea* (Sunn hemp)—(three types)

The observations in the plots indicate that

(*a*) *Urena lobata* and *Sida rhombifolia* are both very hardy but are very branchy at the spacings in which they were grown (12″ × 12″ for *Urena* and 12″ × 6″ for *Sida*). Observations show further that reduced spacings will perhaps reduce this tendency and encourage growth of the plants in length. These points will be studied next year, in closely spaced plots.

(*b*) *Abroma augusta* is a very slow grower but it grows to a tall unbranched plant.

The *Urena* plants with their branches attained an average height of 4 ft. before they were harvested at flowering stage whereas the *Sida* plants grew barely to 3′ in length. The fibres of some stems of *Urena, Sunn hemp, Altissima* and other plants were extracted after retting in water in the usual way. Fibre of *Urena* was found to be white and of very lustrous and silky appearance.

The seeds of Urena are normally very slow to germinate due to the presence of a persistent *spiny* covering. In the case of *Sida* the testa is also very hard. Scarification of the seed coats is therefore found to be a very necessary operation to hasten germination. This was tried with Conc. H_2So_4 in which the seeds were soaked for about 30 to 40 minutes followed by thorough washing in large volume of water and subsequent drying before sowing.

(*c*) Sunn hemp (*Crotalaria juncea*)—

Of the three Sunn hemp types under observation the one from Palamau gave the tallest and the most healthy and vigorous plants as compared to the other two types obtained from Kanpur (Black seeded and white seeded types).

To study the behaviour of Kharif Sunn hemp under low temperature conditions in winter, two strips of land were put under two types of Kharif Sunn hemp, one a black-seeded type and the other a white-seeded one, both from U. P.

The germination of seeds of both types was quite uniform and very satisfactory, but the subsequent growth of the plants was very slow. The plants instead of growing in length began to throw branches copiously and flowered very early long before the advent of spring. But the early formed flowers failed to form pods or formed pods which did not persist on the plant and were shed off. The formation of healthy full grown pods which lasted to form good seeds increased with the rise of temperature. Ultimately all the plants were full of

pods much more than what is usually available from a normal plant in the Kharif season. This feature was interesting from the point of seed multiplication of Sunn hemp in winter in case the Kharif crop gets destroyed somehow.

There was, however, to some extent an attack of insects (unidentified) which bored through the pods and settled inside to eat through the seeds. It is expected that with adequate and timely precaution such a depredation may be reduced to a bare minimum.

III. TRIALS

A. *Hibiscus sabdariffa.* var. *altissima.*

(*a*) *Line sowing Vs. Broadcast sowing*

To study the economics of growing "altissima" in lines as compared with the usual method of sowing broadcast and to study the effect of different stages of harvest on yield and quality of fibre, a trial on the factorial model was designed and laid out with the following treatments.

(*i*) Broadcast
(*ii*) No thinning × 12″
(*iii*) 2″ × 12″
(*iv*) 4″ × 12″
(*v*) 6″ × 12″

} × 3 stages of harvest *viz.* bud, flower and pod.

These 15 treatments were in 6 replications. In broadcast plots the usual thinning, as given by the cultivators to jute crop, was given. In the line-sown plots interculture was done by wheel hoeing, whereas in the broadcast plots it was done by hand as usual.

The results have shown that broadcast method proved significantly superior to line sowings, in yield. There was no significant difference in yield between no thinning × 12″, 2″ × 12″ and 4″ × 12″ treatments; but the first two treatments were definitely better than 6″ × 12″ while 6″ × 12″ was as good as 4″ × 12″.

Regarding the respective position of the different stages of harvest the findings are that there is no difference in yield of

fibre between the plants harvested at flower and pod stages but both proved significantly superior to bud stage.

For quality test, the fibres from each sub-plot unit representing the different stages of harvest were sent to Technological Research Laboratories. The results show that fibres obtained from plant harvested at bud stage are of better quality.

(*b*) *Retting of Altissima plants.*—It was observed that when the *Altissima* plants were ready for harvesting for the extraction of fibre, the temperature of the retting water came down to a considerable extent; as a result of which the total period of time required for complete and satisfactory retting had to be extended beyond 36 days. Further, the entire length of the stems did not ret uniformly, the basal 3 ft. remained half-retted or three-fourth retted while the remaining part was completely retted. To reduce this defect a differential retting by dipping the basal parts for a longer period was tried with some improvement in uniformity of retting. This point will be investigated more thoroughly next year.

(*c*) *Selection.*—Ten pigmented single plants were selected from the *Altissima* seed plots and experimental plots wherein the population of plants under observation was supposed to be absolutely free from any pigment in any of the vegetative parts of the plant.

B. *Dual-purpose Linseed*

A comparative trial of two dual-purpose linseed types was conducted in the Rabi season under irrigation from the farm tube well. The trial was designed according to a replicated paired-plot model.

The results show that both with regard to seed and straw yields, which were rather low, there was no significant difference between the two samples under observation. The average seed yield of both ranged round 4 mds. per acre.

The extraction of fibre from the dried straw could not be undertaken for want of breaking and scutching appliances.

The purchase of a breaking and scutching machine is of an urgent necessity. A method of extraction by breaking and scutching with mallets and wooden blades will also be tried.

IV. SPECIAL FIBRES

1. *Bast fibre group*:

Ramie—Attempts were made to set up a plantation of ramie on a fairly big scale at Chinsurah farm where, previous observations showed that it could be grown very successfully. As a matter of fact, Ramie is a very hardy plant and it has been found that as a result of long cultivation it almost becomes a weed establishing over a wide area round the centre of its cultivation. From an old plantation, suckers were removed and a part of the area set apart from the new plantation was covered during the rainy days in the early part of winter of the year under review. Some suckers were also received from Assam and planted. This latter type has broader leaves and is supposed to yield more fibre than the type growing in the old plantation on the Chinsurah farm.

The method of extraction of fibre as is practised by the local people of Assam by scraping, stripping by hand and retting in water was tested with some mature canes harvested from the old plantation at the flowering stage, in various combinations, both in a dry and green condition. The results of these crude methods did not prove satisfactory. Machine decortication followed by degumming of the decorticated fibrous material with proper chemicals is reported to be a better method for extracting good fibres from the canes of Ramie. Work on this line will be undertaken after a decorticating machine is obtained. Machine decortication of Ramie has already been found in America and Australia to be the best and most economical method in the process of extraction of fibres of the desired standard.

2. *Hard Structural Fibre Group*

Agaves—With a view to study the possibilities of the plants of the Agave group particularly under poor land conditions, it was decided to set up an Agave plantation on a part of the highland area of the Chinsurah farm. Attempts were made to

obtain enough propagating material of different *Agave* and *Sanseviera* types from Southern India but not much material was available during the year under review. A renewed attempt will be made next year so that the desired plantation of these hard fibres may be set up in no distant future.

A consignment of leaves of *Agave cantala* was received from Madras. The fibres from these leaves were extracted after retting of the leaves were done by the ordinary method of retting in water. This was done in a pucca Vat in the laboratory compound. The fibres obtained were brown and not ivory white like the machine decorticated material.

A machine will be necessary for the extraction of fibre of good quality from the leaves of plants belonging to the structural fibre group.

V. SEED MULTIPLICATION

(*a*) *Kharif season*—For the multiplication of seeds of the different fibre plants collected so far, with a view to get enough quantities for conducting trials on a field scale, seed plots of the following were laid out in the farm and sown in the kharif season:—(1) *Sunn hemp* (three types), (2) *Altissima* (one type), (3) *Urena* (two types), (4) *Sida* (two types).

(*b*) In the Rabi season the following linseed types were grown for raising seeds: Type J.W. 7 and 3 types, one each from Kanpur, Delhi and Sabour.

VI. CYTOLOGICAL & ANATOMICAL INVESTIGATIONS

(*a*) The study of the characteristics of growth, development and structure of fibres of various plants under observation was undertaken in the laboratory. Preliminary investigations on the distinguishing features of their anatomy regarding the outline and the aggregation of the fibre bundles as well as the dimensional differences in the ultimate fibre cells, and the growth and development of fibres have been made.

(*b*) Cytological investigations of all the various fibre plants have also been undertaken to study their respective chromo-

some numbers. The numbers of Chromosome in some as determined are as follows:—

Abroma — 2n = 20
Sida — 2n = 28
Urena — 2n = 28
Ramie — 2n = 28
Hibiscus cannabinus — 2n = 36
Hibiscus sabdariffa Var *altissima* — 2n = 72.

A detailed and full account of this line of investigation will appear later in the form of a note.

(*c*) A study of the effect of colchicine and other chemical preparations such as gammexane on the production of polyploids in some of the fibre plants other than Jute has also been taken in hand. In *Urena lobata* it has been possible by treating seeds with colchicine to produce a tetraploid with 56 chromosomes (4n=56). This tetraploid will be grown in pots, in the first instance, to record its survival value and morphological characteristics.

VII. EFFECT OF TREATMENT OF SEEDS OF VARIOUS FIBRE PLANTS WITH CONCENTRATED H_2So_4

The effect of treating the seeds of the different fibre plants under observation such as *Sida, Abroma, Urena, Hibiscus* spp., etc, with Conc. H_2So_4 for varying lengths of time, on the speed of germination and the subsequent growth of the plant, has been under investigation. Some very interesting results showing an appreciable increase in the speed of germination have so far been obtained. *Sida* and *Urena* which usually take about 3 weeks to germinate in an erratic way, germinated uniformly after 3 days of the treatment of the seeds with Conc. H_2So_4 for an hour. A complete account of the results of these investigations will appear in the form of a note after the work is completed.

DISEASES

Hibiscus sabdariffa var *altissima*—The leaves were attacked with *Phoma sabdariffa* from the 6th week. The fungus was isolated for further studies. *Cercospora hibisci* was also found in the leaves causing necrosis. This was also isolated for inoculation studies.

Crotalaria juncea—In the early stages of 3-4 weeks, plants were found to wilt, particularly in the water logged area.

Plants died even after water was drained off. No fungus pathogene was observed or could be isolated. Bacterial colony was seen in sections of the stem at ground level and has been isolated for studies.

At harvest stage rust (*uromyces*) attacked stem and leaf and caused considerable damage to pods.

Urena lobata—Stems show necrotic lesions 3-4 inches above the ground level. Infested stems began to wilt from tip downwards. About forty per cent of the seed crop was attacked. On isolation *Fusariun* sp. was found. Inoculation studies are in progress.

PESTS

The following pests have been noted on fibre plants other than jute.

(1) *Phenacoccus hirsustus* Gr. on *Hibiscus sabdariffa* var. *altissima.*

(2) *Pinnaspis sp.* Gr. on *Hibiscus sabdariffa* var. *altissima.*

(3) Aphids (unidentified) on *Hibiscus sabdariffa* var. *altissima.*

(4) *Spermophagus tessellatus* Mots. on stored seeds of *H. cannabinus.*

(5) *Tetranychus bioculatus* on *Sida rhombifolia.*

(6) Thrips on *Abroma augusta.*

(7) Aphids on *Abroma augusta.*

(8) *Utethesia pulchella. L* on *Crotolaria juncea.*

Of these, *Phenacoccus hirsutus* is a major pest and the study on its biology and control is undertaken.

Phenacoccus hirsutus—The pest attacks the growing apical region of the host plant and causes stuntedness. The attacked region differentiates out by its swelling, shortened internodes and deep green colouration. Apical leaves of the attacked region appear as if arising in a tuft and give the plant a "bushy top" symptom.

Table below shows that such attack causes appreciable decrease in plant-height.

Age of crop.	Normal region.			Affected region.		
	Av. No. of internodes.	Av. length of internode incl. hypocotyl. (cm)	Av. stem diam. below affected region. (cm)	Av. No. of internodes	Av. length of internodes. (cm)	Av. stem diam. (cm)
1½ months ...	7	3·1	0·4	6·1	0 6	0·6
4 months ...	28·6	4·0	0·4	10·5	1·1	0·6

Internal structure of the affected region changes appreciably. There is hypertrophy of the deeper cortical cells and the formation of these giant cells are responsible for swelling of the affected region.

When the attack subsides, proliferation of the apical meristem starts and one or a number of apical shoots may come out giving the plant ultimately in the latter case the appearance of a "broom-like" top.

In cases of severe attack, the drainage of tissue-sap is so high that the plants do not survive at all.

Attack in capsules interferes with their normal development and result in a reduced number of seed formation.

Males during early stage and females in all stages feed by thrusting into the host tissues their long and filamentous stylet fascicle which measures on average 1.44 mm. in length and 4.4 in diam.

Females lay their eggs in batches along with some flocculent mealy threads in ovisacs made of fine waxy fibres. Total oviposition period ranges from 5 to 8 days and maximum number of eggs laid by a female—as recorded—is 354. Each egg measures 0.29 mm.—0.32mm. in length and 0.17 mm. in breadth. Incubation period is 7 days at 84 ± 4°F.

Nymphs are light orange in colour and they secrete white meals. Male nymphs after early instars form mealy-cocoon on the host plant or at times on the surface of soil. Two

winged males emerge out from the cocoos while the females are apterous for the whole of their lives.

For control BHC has been tried with negative result.

An indigenous predator (*coccinellinae*) has been found to feed upon the nymphs and adult females and the possibility of biological control is under investigation.

Spermophagus tessellatus Mots.—The pest has been noted on stored seeds of *Hibiscus cannabinus*. Grubs feed upon the cotyledons of the seed. Infected seeds can be distinguished by the presence of glistening egg on the seed-coat. During oviposition females secrete an adhesive substance which firmly glues each egg with the seed coat. Eggs are laid singly, rarely 2, 3 or more eggs are laid on a single seed and the tendency is to infect as many seeds as possible as can be seen from the table below.

No. of egg per seed.	Frequency of egg laying (mean per cent)
1.	84·67
2.	14·86
3. or more	0·47

For control, treatment of affected seeds by 0.5% BHC in the container bring 100% adult mortality within 24 hrs.—30 hrs.

INFORMATION

The following new appointments were made during the period under report.

Sri B. Das Gupta, Assistant Botanist, was appointed Botanist with effect from 16th July, 1948.

Sri N. Dutt joined as Assistant Entomologist and Sri P. K. Mukherjee as Entomological Assistant.

The following also joined in the respective posts noted against their names:

Sri M. S. Sarma	...	Scientific Assistant.
Sri N. S. Rao	...	Anatomical Assistant.
Sri B. K. Das & Sri D. B. Dua	... ...	Agronomical Assistants.
Sri R. Bose	...	Microbiological Assistant.
Sri G. S. Halder	...	Junior Chemical Assistant.

Due to the promotion of Sri B. Das Gupta, Assistant Botanist as Botanist, Sri S. J. Ghosh, Scientific Assistant, officiated as Assistant Botanist for some time. He was later temporarily appointed as Assistant Development Officer under the Jute Development Scheme.

Sri K. P. Roy joined as Assistant Botanist in the Substitute Fibre Section.

VISITORS

Among visitors to the Institute during the year the following may be mentioned.

Sir Datar Singh—Additional Secretary, Ministry of Agriculture, and President, Indian Central Jute Committee.

Sri S. M. Srivastava—Secretary, Indian Council of Agricultural Research.

Edger G. Nelson—Agricultural Attache to the American Embassy in India.

PUBLICATIONS

The following is a list of papers published during the year.

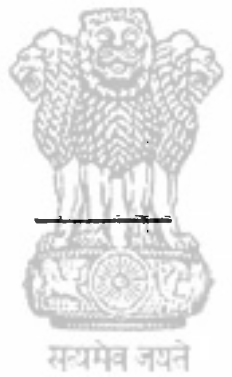
1. Kundu, B. C. (1948)—Jute Production in South India. Commerce Annual Review Number, 1948.
2. Kundu, B. C. (1948)—Increased production of Jute in India. Business Week Annual Number.

3. Das, G. M., Mukherjee, T.D., and Sen Gupta, N. (1948)—Biology of the common mealy bug, *Ferrisia virgata* Ckll, (Coccidae) a pest on jute, *Corchorus olitorius* L, in Bengal.

Proc. Zoo. Soc. Vol. I, No. 2.

4. Das, G. M. (1948)—Insects and mite pests of jute. Sc. & Cult. Vol. 14, No. 5.

5. Rao, N. S. and Kundu, B. C. (1949)—Effect of gammexane on the root tips of *Corchorus capsularis* Linn. Science and Culture, Vol. 14.



APPENDIX

Programme and progress of work

JUTE

Programme of work as sanctioned.	Progress made.	Nature of future work
BREEDING & GENETICS OF JUTE.		
1. Collection of varieties and types.	In all 688 district types of jute, including 121 fresh collections made during survey tour of the provinces, were grown during the season. 289 types failed to germinate. Seeds of 5 wild species of *Corchorus* were collected. A composition study of the individual types was made, the variabilities noted and a large number of selections made for yield and other characters.	Collection of district types from unrepresented jute growing areas will be continued and an intensive study of the individual types and isolation of fresh breeding materials from year to year carried out.

Programme of work as sanctioned.	Progress made.	Nature of future work
2. Breeding of improved strains of jute.	12 breeding trials were carried out during the season and 7,291 selections were made for yield, earliness and other desirable characters after a study of the cultures and the types above.	Progressive sifting of the materials in hand.
	In the trial of district materials one local type, Deshimara, proved significantly superior in yield to the control (D154) by 19.5%. In the first year test of selections one culture, C47Nj-279 was significantly superior in yield to the control (D154) by 14.6%, while three early cultures proved as good in yield as the control in the fifth and sixth year test of selections.	Confirmation of the promising cultures by further tests.
	In a test of selections in multiple crossing materials a large number of cultures in purification stage proved as good as the control (D154) in yield, but possessed some of the most desirable characters, such as non-branching habit, earliness and resistance to stem-rot.	Isolation and fixation of desirable strains and their progressive tests.

	Seeds obtained by multiplication of improved strains during the season were sufficient to plan the proposed 54 subvention trials for Bengal, Bihar, Assam and Orissa. Six improved strains of which three were *capsularis* and three *olitorius* were released for the purpose.	Assessment of the improved strains from their performance in cultivators' plots under varying soil and climatic conditions for at least three successive seasons.
Polyploidy and interspecific hybridization in jute.	As a result of an elaborate treatment of a large number of seeds with colchicine, 11 *capsularis* and 1 *olitorius* polyploids were obtained.	Confirmation of the polyploids by further morphological and cytological studies. Fixation of polyploid races of jute.
	24 interspecific crosses between polyploids of the two species were attempted with 10 successes.	Study of interspecific hybrid, if any, obtained.
Vegetative rapprochement as a means of overcoming interspecific cross incompatibility in jute.	1st generation interspecific vegetative grafts between *capsularis* and *olitorius* were made. Seeds were collected from scions of 26 such grafts.	Seeds from the 1st generation grafts will be grown and 2nd generation grafts made. Interspecific crosses between 2nd generation grafts will be attempted.
Varietal differences of fibre content in jute and breeding high fibre-yielding strains.		To be taken up when laboratories are fully equipped.
3. Mode of inheritance of characters.	69 genetic strains were sown in duplicate plots. All except 5 strains failed to germinate. A comprehensive selection represent-	Isolation of the missing genetic strains, purification of same and fresh selections.

Programme of work as sanctioned.	Progress made.	Nature of future work
	ing the different characters observed, was made in the type plots.	
	Isolation of the genotypes of the green group was taken on hand and crosses between full green (1) and three members of the red group were obtained for this purpose.	Study of the F_1 progenies.
	Study of the inheritance of serrated petal character in jute was undertaken and crosses between serrated and ordinary petal types obtained.	Study of the F_1 progenies.
	Olitorius types with intensely blotched leaf were isolated.	Crosses between blotched and ordinary leaf types will be obtained.
	Capsularis strains with pods in clusters failed to germinate.	Isolation of cluster types from materials in purification series.

ANATOMICAL AND CYTOLOGICAL INVESTIGATIONS.		
Differentiation of tissues.	Study is in progress.	As in column 1
Internode length and its correlation with ultimate fibre length.	The studies had to be dropped for lack of personnel and proper laboratory facilities.	As in column 1
Comparative embryology of *C.capsularis* & *C.olitorius*.	In progress.	As in column 1
Cytological study of the colchicine treated jute plants.	In progress.	As in column 1
Inducing mutations with certain chemicals.	Gammexane induced polyploidy. Investigations in progress.	Cytology of wild spp. of *Corchorus*. As in column 1
Study of chromosomes.	In progress.	As in column 1
CULTIVATION.		
1. The possibility of line sowing of jute.	*Capsularis* and *olitorius* trials carried out under Chinsurah conditions proved that sowing jute in lines was much more economical and profitable than sowing broadcast. In the *capsularis* trial all line-sown plots	(*i*) Confirmation of the results obtained by further trials. (*ii*) Demonstration to the cultivators the advantage of sowing jute in lines.

Programme of work as sanctioned.	Progress made.	Nature of future work
	were significantly superior to the broadcast plots in yield of fibre.	(*iii*) Perfection of a simple seed drill for the cultivators. (*iv*) More cultural experiments will be taken up.
2. Manurial trials.	Four trials were carried out with fertilizers and organic manures available locally. (*a*) *Trials with fertilizers.* Double dose of Ammonium sulphate at 3.6 mds. per acre increased the yield of fibre in *capsularis* considerably. Higher levels of same or its combination with Muriate of potash did not prove any better. In *olitorius* single dose of Ammonium sulphate at 1.8 mds. per acre was as good as higher levels of same or its combination with Muriate of potash. (*b*) *Trials with organic manures and their combinations with fertilizers.*	As in column 1

	Single dose of town compost at 150 mds. per acre proved better than sludge or F. Y. M. alone applied at the same or higher level. Higher level of town compost or combinations of town compost and sludge with fertilizers failed to increase the yield of fibre appreciably.	
3. Quality of fibre at different stages of maturity.	Fibres obtained from plants harvested, by selection, at 7 different stages of maturity from "well-before-bud" to "pod-ripening" stages were sent to T. R. L. for quality tests.	The study will be continued on a more elaborate scale combining yield with stages of harvest.
4. Crop stand in relation to yield and quality of fibre.	The actual stand obtained per plot was much below the desired stand and the spacings were wider for the respective treatments. The crop was however harvested and fibre obtained as scheduled for results of comparative value that could be obtained from such a trial. The yield data were analysed and fibres sent to T. R. L. for test.	For practical difficulties of getting desired spacings in the field, the study will be continued with a modified trial based on seed rates.
5. Effect of date of sowing on plant growth, flowering and fibre yield.	It was too late to undertake sowing of the experiment when the fields were ready.	As in column 1

Programme of work as sanction.	Progress made.	Nature of future work
6. Effect of different seed rates on yield of seed.	One *capsularis* and one *olitorius* trials were carried out with different seed rates. The results indicated that seed rates as low as 4 lbs. per acre for *capsularis* and 2 lbs. per acre for *olitorius* could be adopted for the purpose of multiplication without appreciable loss in yield of seeds.	Confirmation of results obtained.
7. Yield of seed in manured and unmanured plots.	A preliminary trial with *capsularis* was carried out. Difference in yield of seed from manured and unmanured plots was highly significant.	The study will be continued on a more elaborate scale when proper facilities are available.
8. Double and triple-cropping of jute land.	Doubled and triple-cropping of jute land under Chinsurah conditions were tried in a *capsularis* trial in the low land and in two test plots of *olitorius* on the high land. Transplanting of paddy after harvest of jute crop was unduly delayed for want of bullocks at the proper time, resulting in low yield of paddy. The results obtained, however, indicate that there are possibilities of growing paddy after *capsularis* and *olitorius* jute profitably.	As in column 1

	As a result of our propaganda cultivators, even in an *olitorius* district like Hooghly, practised double-cropping of jute land on a fairly large scale with success.	
9. Spacing and manurial requirements of seed jute.	... ...	As in column 1
10. Investigations on retting technique.	... ...	As in column 1
SOIL AND BIOCHEMICAL STUDIES.		
Biochemical studies of retted jute, retting water and soil.	... ...	As in column 1
DISEASES.		
Study of the effect of environmental factors on secondary infection of stem-rot.	... ...	As in column 1
Study of the stem-rot fungus.	Isolation of various pathogens were carried out. Inoculation experiments are in progress.	(*i*) Inoculation experiments with *Macrophomina Phaseoli*.

Programme of work as sanctioned.	Progress made.	Nature of future work.
		(*ii*) Study of cultural characteristics. (*iii*) Study of the biology of pathogenes other than *Macrophomina phaseoli.*
Investigation on the methods of control of stem-rot, root-rot and other diseases.	174, selections were made for next year's trial for breeding resistant types. Four separate trials with Ammonium Sulphate, Muriate of potash, Sludge and town compost were conducted and results were obtained. Seed treatment with Agrosan GN with 4 per cent. mecury was found to be effective.	(*i*) Selection and breeding of stem-rot resistant types. (*ii*) Application of fertilizers to check incidence of disease. (*iii*) Seed treatment and storage. (*iv*) Chemical sprays to control infection by pycnospores. Investigations into the causes leading to loss of viability in seeds.
PESTS.		
Investigation on the control of jute apion.	γ BHC has been found to kill adult apion under laboratory condition.	Selection of resistant types. Efficacy of γ BHC for control under field conditions.

Investigation on the control measures for other pests.	Preliminary studies on jute mealy-bug, scale insect and thrips were made.	The study will be continued.
	Laboratory experiment on chemical control by different insecticides were carried out. D. D. T. and γ BHC have been found to be very effective in some cases.	The study will be continued.
	SUBSTITUTE FIBRES.	
1. Collection of varieties and types.	Seeds, suckers and bulbils, as the case may be, of the different species and types of 11 different fibres yielding plants were collected from various sources.	Collections of propagating materials of various fibre plants indigenous both to Indian Union and countries abroad, will be continued in future with a view to build up a comprehensive stock of plant breeding materials to work upon.
2. Obserations.		
Preliminary observations for a close study of the botanical characteristics and the growth and developmental phases of fibre plants.	All the distinguishing features in the growth and developmental phases of four fibre plants namely *Urena lobata*, *Sida rhombifolia*, *Abroma augusta*, *Crotalaria juncea* (three types), were recorded. These observations will serve as an effective and proper guide in future breeding and agronomic investigations.	Observations of this nature in small observation plots will be continued in future will all freshly collected material relating to the various fibre yielding plants that will be added to the collection.

Programme of work undertaken. (1)	Progress made. (2)	Nature of future work.
3. Agronomic and breeding trials.		
(*i*) Line Vs. Broadcast sowings of *Hibiscus sabdariffa* var. *altissima* on a complex factorial model to determine the effect of various factors under investigation on the yield and quality of fibre.	On statistical analysis of the preliminary results it is seen that broadcast method is significantly superior to line sowings in yield of fibre. The quality test of fibres from the plots, harvested at different stages of growth of the plants, under the 15 different combination showes that plants harvested at bud stage yield fibres of better quality.	This experiment will be continued for at least three or four more seasons in future to combine the seasonal factor in the scheme for correctly assessing the average optimum level of the various agronomic factors. This type of experiment will be taken up for *Mesta*, *Sunnhemp* and also for other fibres.
(*ii*) Comparative trial of dual purpose linseed types.	A statistical analysis of the results was made but it did not reveal any significant difference in the yield of seeds nor in that of straw between the two types under observation.	Next year this experiment will be changed into a varietal trial on a randomised block model with a few more types added to the scheme.

	For the want of breaking and Scutching appliances the yield and quality of fibre have not yet been studied.	The study of the quality and yield of fibre will be taken up soon after the breaking and scutching appliances are available.
(*iii*) Selections.	10 pigmented types of *Hibiscus sabdariffa* var. *altissima* have been selected from the green *altissima* plot.	Selection work will continue with regard to all fibre plants under investigation. It will be based on date of flowering, colour differences, growth peculiarities and morphological differences.
4. Special fibres: (*i*) Ramie.	Some progress has been made to set up a plantation of Ramie on a moderately big scale.	The Ramie plantation will be extended and maintained properly in future.
	The local crude hand method of extracting fibre from Ramie canes as practised in Assam was tried in various ways but the trial was not successful. The extraction of fibres, of good standard, from Ramie canes can only be done with the help of an efficient decorticating machine followed by degumming of the fibrous material by suitable chemicals.	Attempts will be made to get a suitable decorticating machine from Australia to deal with the Ramie canes for the extraction of fibre. Degumming of the decorticated fibrous material with proper chemicals will also be tried.

Programme of work undertaken. (1)	Progress made. (2)	Nature of future work. (3)
(*ii*) Hard fibres.	An attempt to get sufficient number bulbils of Agaves from Southern India was made but not much material was available. Due to this a plantation of this plant, as was schemed for, could not be set up.	Attempts will be made to get sufficient propagating material of some plants of the hard fibre group next year, with a view to set up the desired plantation for the study of their possibilities.
5. Seed multiplication.	Seeds of the different fibres plants were multiplied on a moderate scale for future investigations.	Seed multiplication of various fibre plants under investigation, on a moderate scale, will be a routine feature in future for the purpose of raising sufficient seeds of each for field trials which may be decided upon during the progress of work.
6. Anatomical and cytological investigations.		
(*i*) Anatomical studies on the groth and development of fibre.	(*i*) Some progress has been made on the study of the characteristics of the fibres of various plants under investigation. Distinguishing features	As in column 1

	regarding the outline and aggregation of fibre bundles and the dimensional pecularities of the ultimate fibre cells have been recorded in some.	
(*ii*) Cytological investigations.	(*ii*) Root tip studies to determine the chromosome complements and characteristics of the various fibre plants under investigation have been in progress. The number of chromosomes in some has been determined.	As in column 1
(*iii*) Inducement of polyploidyin some of the fibre plants such as *Sida, Urena, Mesta, Altissima,* etc. by treatment with Colchicine and other chemicals.	(*iii*) Work on this line has been in progress with some success by the treatment of the seeds with Colchicine. Some of the seeds of *Urena* treated with Colchicine 0.1%, have developed tetraploidy. These seeds are being grown to study their survival value and morphological characteristics.	This line of study will be continued.
7. Seed treatment.	The effect of treating the seeds of various fibre plants with concentrated H_2SO_4 for varying periods of time on the speed of germination and subsequent growth of seedlings was studied.	As in column 1

Programme of work undertaken.	Progress made.	Nature of future work
	The effect is particularly promient on *Sida* and *Urena*, which, normally, without any scarification of the seed coat germinate erratically and take more than three weeks to germinate. With a treatment of concentrated H_2SO_4 for 30—40 minutes *sida* seeds which have a very hard seed coat and Urena seeds which have a spiny covering, both germinated uniformly within three days after the treatment.	As in column 1
8. Diseases. Incidence of diseases on fibre crops other than jute and their control.	Incidence of *Phoma sabdariffa* and *Cercospora hibisci* on *Hibiscus sabdariffa* var *altissima*, *Uromyces* sp. on *Crotalaria juncea* and *Fusarium* on *Urena lobata* were recorded. The study on the biology of these fungi and inoculation experiments are in progress.	The work on this time will be continued.
9. Pests. Investigation on the biology and control of pests on fibre crops other than jute.	Studies on the biology of *Phenacoccus hirsutus* and *Spermophagus tessellatus* were made.	To be continued.
	Indigenous predator on *Phenacoccus hirsutus* has been found out for investigation on biological control.	To be continued.

APPENDIX II

ANNUAL REPORT ON THE TECHNOLOGICAL RESEARCH SCHEME FOR 1948-49

I. INTRODUCTION

Efforts were made during the year to secure the closer collaboration of the trade. A circular letter was prepared, and circulated to mills through Indian Jute Mills Association Research Institute, indicating the various ways in which Technological Research Laboratories could assist the trade in practical problems. The response was only moderately good but a number of firms sent samples for tests and several sent representatives to discuss various problems or to study the methods in use in the laboratories.

Mills are greatly preoccupied with labour and supply problems and this is no doubt one reason for the apparent rather lukewarm attitude, though there are notable exceptions. Another reason is the paucity of research departments or scientific staff in the mills; this often results in scientific publications being overlooked and mislaid and general lack of liaison with the laboratories. Moreover, since the Technological Research Laboratories have been mainly engaged on work concerned with the improvement of the raw material, the trade does not automatically look to them for assistance with day to day technological problems. However, much has been done during the last ten years that is of direct interest to the mills. To assist in the appreciation of the results obtained we have completed a fresh summary review of the position reached in the work. In addition, a number of leaflets have been prepared dealing with matters of direct interest to practical mill men. It is hoped that these will be widely circulated to mill Managers, Assistants and others to whom they may be of interest.

During the year Mr. A. S. Gillies who had been in Technological Research Laboratories as Manager since April 1938, found it necessary to return permanently to the U. K. for

health reasons. During his ten years of service he contributed to an outstanding degree to the work of the laboratories, and in a variety of ways, and he has left a gap that it will be difficult to fill. Mr. P. K. Deb, Manager's Assistant, has ably carried out the Manager's duties pending the appointment of a new incumbent.

Dr. P. B. Sarkar, Senior Research Chemist, made an extensive tour (from June to December) of the U. K. and North America, visiting all the more important textile research institutes, technical colleges and other institutes whose work has a bearing on our own, as well as mills, factories and bleachgreens. His report on the tour was placed before the Indian Central Jute Committee at its meeting in March, 1949. There is no doubt that the tour was very beneficial and that the information obtained will materially assist in future work in the Laboratories.

The Technological Research Laboratories Reorganisation Scheme remains in abeyance at present on account of the decision to divert available funds for work connected with the growing of more jute in the Indian Union. For similar reasons it was decided at the Indian Central Jute Committee Meeting held in March 1949 to defer for some time the appointment of staff in connection with the Technological Research Laboratories Extension Scheme. The small additional room for work on the chemical technology of jute is now ready for taking into use. A stainless steel Pegg dyeing machine has been ordered and is expected to arrive shortly. This should be useful for the chemical treatments of moderate size samples of fibre and yarn.

The Director, Technological Research Laboratories and the Senior Research Physicist were appointed to some committees of the Indian Standards Institution and have attended a number of meetings.

II. BACKGROUND RESEARCH.

1. Tensile strength of twisted bundles of fibre-strands.

Until recently in work on the prediction of spinning quality from physical fibre characters, the ballistic work of

rupture of twisted fibre-strand bundles, of standard size and weight, has had a prominent place. Later, as reported last year, the study of the tensile strength of standard twisted bundles was taken up. The results show considerable promise and data for ten samples of white jute of widely different quality are given below. In these tests a Z twist (or right-hand twist, as usually used for jute yarns) was employed.

Strength of Standard twisted bundle (lb.) (Z twist)	Yarn Quality Ratio (10 lb. yarns)
425	109
388	104
372	97
354	73
346	83
341	79
257	66
230	52
229	54
224	62

The bundle strength tests and the spins were made on jute carefully sampled out from the same bulk. It will be seen that the connection between the strength of the bundles and the quality ratio is fairly close.

Another set of tests was made on the same samples with the insertion of S twist into the bundles. The tensile strength of the bundles was then found to be nearly 3 per cent. higher on an average. This is a point of considerable interest, though it does not necessarily mean that stronger jute yarns could be obtained if the S or left-hand twist were employed. The optimum twist factor may be different for S and Z twists and series of tests at a range of twists would be necessary to settle the point.

The co-efficient of correlation for bundle strength and 10 lb. yarn quality ratio for these ten jute samples, was 0.942 when Z twist was used in the bundles and 0.969 when S twist was

used. The multiple correlation co-efficients for yarn quality ratio against bundle strength and torsional rigidity (next section) were 0.942 for Z twist and 0.97 for S twist. These are promising results, but it is common to find that with an increase in the number of samples the correlation co-efficients become lower. The higher co-efficients found with S twist in the bundles are of interest, but the reason for the difference is not clear and it is possible that it would become less if a larger number of samples were examined.

2. Torsional Rigidity of Bundles of Fibre Strands.

The same bundles that were used in the foregoing tests were examined for torsional rigidity by the method in which the time of oscillation of a circular plate fixed to the lower end of the bundle is observed. It was found that when the plate was turned clockwise (as seen from above) for the insertion of the initial twist, producing Z twist in the bundle, the rigidity was, on an average, higher than when the reverse twist was inserted. The difference appears to be too small, however, to have much practical importance in spinning, but it was a matter that merited investigation. The average rigidity with the initial insertion of Z twist was 20.68, as compared with 20.57 for S twist. The difference is attributable to the fact that the ultimate cells are made up of fibrils arranged in helices with a Z twist. Insertion of Z twist into the bundles tightens up the twist of the fibrils. It has already been noted that when bundles of fibre-strands are twisted, under a standard tension, until rupture occurs the breaking twist is higher for S twist than for Z twist. (See also *Nature*, 163, p.19).

3. Fineness of Strands in Yarns.

The fineness, regularity and degree of complexity of the strands to which the reeds of jute fibre can be broken down in ordinary carding and preparing are all important for spinning quality. If the strands are coarse, the average number in a cross-section of the yarn is relatively small and this makes for yarn irregularity. In addition, stiffness increases rapidly with coarseness. In yarns composed of stiff, coarse strands the

frictional forces tending to prevent disruption on the application of a tensile stress are smaller than in yarns composed of pliable, fine strands. The final fineness of the strands in the yarn is not, however, the only point of importance; the ease with which the longitudinal splitting can be secured during processing is also important. Moreover, fineness may be associated with over-retting and consequent weakness in the fibre-strands. The weakness results in excessive shortening in carding and preparing and hence low yarn strength, though the intrinsic weakness of the over-retted fibre is also a factor.

We have to remember, moreover, that the strands obtained by carding and preparing are parts of the original mesh-work of the reeds. They show various degrees of branching and in some strands in a yarn parts of the mesh-work can still be seen. Much-branched strands, even if the branches are fine, may give inferior spinning quality to coarser but relatively simple, uniform strands.

The method described below has recently been used to gain an idea of the fineness of strands in a yarn. In considering the results it must be remembered however that the apparently separate strands seen in a cross-section of a yarn may be branches of complex strands.

The principle of the method is to cut the yarn under examination into very short lengths (2 mm), shake the cuttings up in water in order to separate the strands and then count the fragments after the suspension has been poured into a shallow flat dish. To make the fragments easily visible, the yarn is dyed with methylene blue before cutting. Counting is facilitated by using a white dish the bottom of which is divided into rectangles. It is convenient (with yarns of about 10 lb. grist) to count the 2 mm cuttings from three pieces of yarn. This commonly yields some 450 to 750 fragments for counting, or 45 to 75 in each rectangle, if the dish is divided into 10 rectangles.

The grist can be determined by weighing 2 in. cuttings adjoining the places from which the 2 mm cuttings were taken.

The mean of ten separate results may be taken, involving the use of 30 separate lengths of yarn, suitably sampled from the bulk.

On these lines the average grex count (micrograms per centimeter) of the fragments from 10 lb. yarns is found to range from 13 to 24, with an average of about 16. It is very interesting to see how this compares with the grex count calculated from the dimensions of the fibre bundles of the plant, as seen in cross-section, and the density of the fibre.

A fairly typical fibre bundle, as seen in cross-section, *Fig. 1*, fits into a rectangle measuring about 0.045 × 0.035 m.m. (area of the rectangle = 1575 sq. microns). If we deduct one third of the cross-sectional area of this rectangle to allow for (*a*) the lumens in the single fibres and (*b*) the fact that the rectangle is not filled by the cross-section of the bundle, owing to rounding at the corners and the presence of channels or grooves, and assume a density of 1.48 for the cell-well substance, we arrive at a grex count of 15.54 which agrees well with the average value found as described above.

Such a typical fibre bundle commonly shows some 15 ultimate fibres in the cross section.

The average grex count of the ultimates is thus of the order of unity. The average diameter of the ultimates as seen in cross-section is about 12 microns (thousandths of a millimetre). It is to be remembered that this average includes sections of ultimates near the tapering ends. So that although the average width of the ultimates is commonly given as about 18 microns, this corresponds with the measurement at the widest part, near the middle.

There is considerable variation above and below the case considered above. For instance we may find 18 ultimates in a cross-section, in which case the average width of the ultimates as seen in cross-section may be about 10 microns if the bundle again fits into a rectangle of 0.045 × 0.035 mm. Moreover, the overall measurements of the bundle may be considerably above or below those just given. Thus a bundle whose cross-section fits into a rectangle measuring 0.05 × 0.042

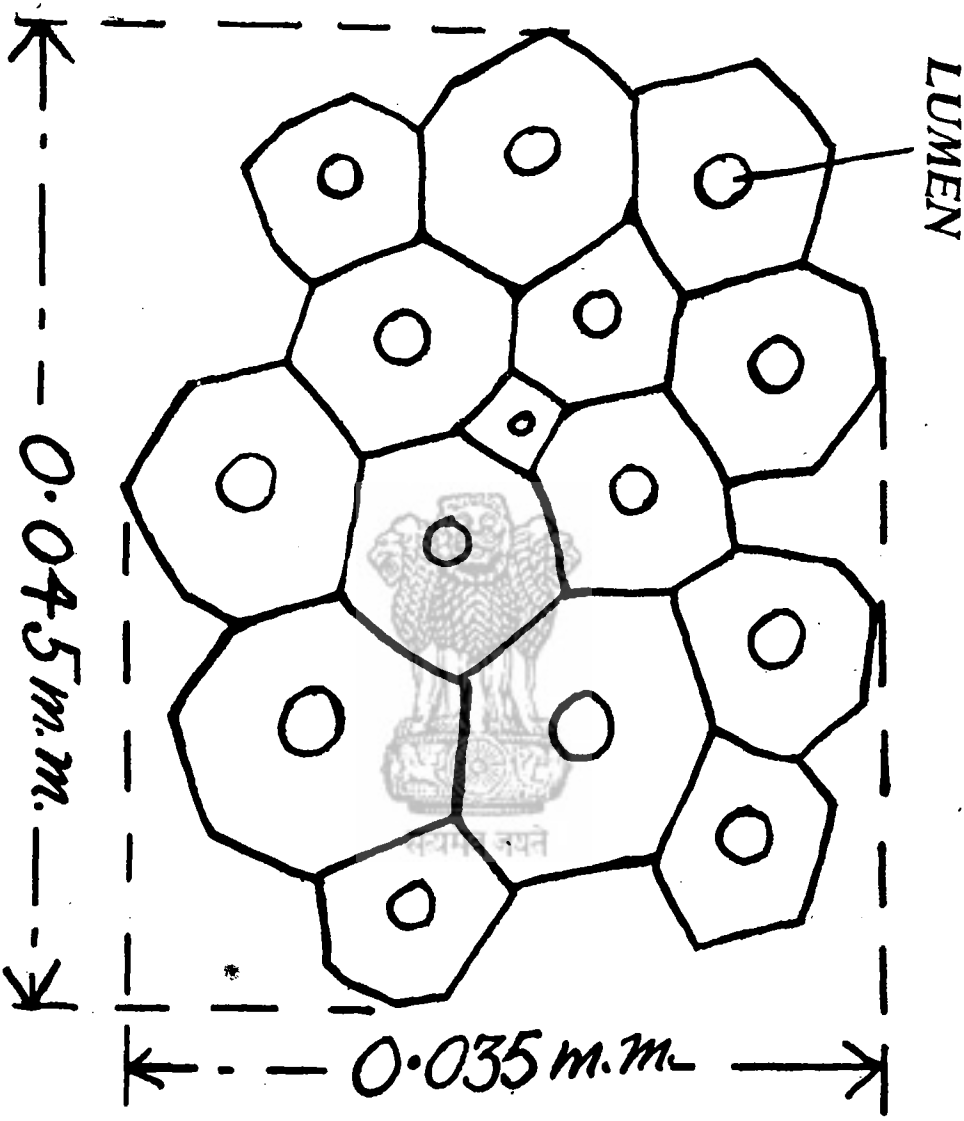


Fig. 1
Typical Jute Fibre Bundle

mm. would have a grex count of about 22 if we again assume a density of 1.48 and deduct one third for lumens and departure from rectangular shape. The size of the lumens may also vary according to variety and conditions of growth.

Evidence is accumulating which suggests that the strands of tossa jute tend to be simpler (less branched) than those of white jute, and this may partly account for the better yarn quality sometimes found with tossa jute even when the strands are coarser (as seen in cross-section or tested by the method described above).

Typical results obtained on 10 lb. yarns, using the 2 mm. cutting method for estimating the fineness of the strands, are as follows:

Jute	Q. R.	Grex count of strands
1. Tossa	122	14.1
2. ,,	103	23.5
3. ,,	85	18.8
4. White	71	19.7
5. ,,	52	13.6

Here the low quality of the white jute sample No. 5 is attributable to over-retting, with far-reaching breakdown of the strands, so that the grex count is low. The high quality of No. 1 may be partly attributed to the presence of fine, uniform strands, the fineness being a natural feature of the plant and not attributable to over-retting. A grex count 19.7 in the strands of No. 4 is rather high for white jute and the rather low quality may be partly attributable to this coarseness. In No. 2 however we have coarseness associated with good quality. The results show fairly clearly that fineness of the strands in the yarn is far from being the whole story where quality is concerned. For high quality fineness must be

associated with good strength and uniformity and the nearest possible approach to a simple cylindrical form.

The connection between the coarseness of the strands obtained by light hand-combing of the raw materials and spinning quality (coefficient of correlation found for 30 samples of white jute – 0.573 with Q.R. and 0.558 with Wt.C.V.) is attributable to the fact that the coarseness so found is an indication of the complexity of the strands. On the other hand the connection between average reed weight per metre and spinning quality (coefficient of correlation was – 0.676 with Q. R. and 0.462 with Wt. C. V.) is attributable to the general greater fineness of the strand in finer reeds.

All these points are of great importance for the plant breeder and the spinner.

The method of estimating the fineness of strands that has been described might be usefully applied to slivers and roves also.

4. Prediction of Spinning Quality from Physical Fibre Characters:

In last year's report a total multiple correlation coefficient of 0.953, based on seven physical characters in relation to yarn quality ratio, was noted. The examination of the 30 samples for nine characters has been completed and a full statistical analysis has been made by Mr. B. K. Chakrabarti. The total multiple correlation coefficient is found to be 0.961 with the Q. R. of 10 lb. yarns and 0.910 with Wt. C. V.

This completes a lengthy series of routine tests and statistical analysis and the results are gratifying. As regards Q. R. about 28% of the variation remains unaccounted for and it may be difficult to improve on this very considerably, though there is room for improvement in the prediction of Wt. C. V (yarn irregularity).

From an examination of the 8th order partial correlation coefficients which have now been calculated—a very laborious task—the importance is clearly seen of the ballistic work of rupture of standard twisted bundles of fibre and of the

torsional rigidity of standard bundles of fibre for the prediction of yarn quality ratio, the partial correlation coefficients being 0.679 and 0.589 respectively, both significant at the 1 per cent level. For Wt. C. V. the 8th. order partial correlation coefficient with reed weight per metre was found to be 0.627, also significant at the 1% level. In this case the partial correlation coefficient is greater than the total correlation coefficient (0.462).

Accounts of the methods employed in the work have been written up and the first instalment, giving sampling methods and describing the estimation of torsional rigidity, has been sent for publication. The results have also been given in summary form in *Jute Bulletin* issues for January and April, 1949. The accompanying table shows the actual and predicted quality ratios and weight C. V.'s for 10 lb. yarns spun by T. R. L. standard process. Under A we have the results predicted from measurements of average reed-weight, average reed-weight per metre, ballistic work of rupture of twisted bundles of fibre, bundle torsional rigidity, bundle flexural rigidity, fineness, apparent density, breaking twist and diameter of twisted bundles (9 characters). Under B are the results predicted from the first four characters only. We gain little by including the other five characters but it is important to know their relationship with spinning quality.

Predicted and Observed Yarn Characters

(White Jute: Standard 10 lb. Yarns)

Quality Ratio			Weight C. V.		
Observed	Predicted		Observed	Predicted	
	A	B		A	B
122	112	112	22	21	21
111	104	104	21	22	22
110	112	114	21	22	22
109	105	104	22	20	21
108	108	107	21	21	21
107	103	103	20	22	21
105	108	107	21	21	21
104	99	98	21	20	20
103	107	107	25	23	23

Predicted and Observed Yarn Characters—(Contd.)
(White Jute: Standard 10 lb. Yarns)

Quality Ratio			Weight C. V.		
Observed	Predicted		Observed	Predicted	
	A	B		A	B
100	96	96	22	22	23
99	103	102	21	19	20
99	94	94	22	23	23
97	102	101	20	22	22
97	96	96	21	23	23
96	101	100	23	22	22
93	93	94	26	25	24
91	98	98	21	20	20
90	91	90	22	23	24
89	93	93	22	24	23
88	87	86	25	23	23
85	87	89	26	23	23
82	83	84	24	25	24
77	82	83	20	22	22
74	75	84	26	26	27
73	69	68	26	28	28
71	68	67	26	26	27
65	62	64	26	28	27
62	62	62	28	27	27
55	68	68	33	30	30
52	47	47	35	35	34

5. Frictional Characters of the fibre

Further experiments have been made using the method, referred to last year, in which a block covered with a pad of fibre is allowed to slip on an inclined plane, also covered with the fibre. A number of interesting results have been obtained.

The coefficient of friction for tossa jute tends to run lower than for white jute, in spite of the generally lower fat-and-wax content of tossa. The difference may be due to a smaller degree of complexity (less branching) in the tossa strands or to a rounder and less channelled form of the strands.

Solvent extraction (which removes fat and wax) increases coefficient of friction and the addition of paraffin wax reduces it (about 4% of wax was added from benzene solution).

Increase in humidity increases the coefficient of friction and when the fibre is soaking wet the effect is very pronounced.

When the fibre was soaked in batching oil and the surplus oil removed as completely as possible by squeezing, a marked increase in the coefficient of friction was observed when the fibres in the pad and on the inclined plane were parallel. The effect was less marked when the pad fibres were at right angles to the others. In another set of experiments different amounts of batching emulsion were applied (namely, 0, 15, 30 and 45%) and the fibre tested after conditioning at 75% R. H. The coefficient of friction increased with increasing amounts of emulsion and since the fibre was conditioned the differences are presumably due to the differences in the amount of oil taken up, and it appears that as far as the movement of fibre past fibre is concerned the batching oil increases rather than decreases the friction. It seems probable therefore that the beneficial effects in spinning of the addition of batching emulsion are due largely to the softening of the fibre and, possibly, to reduction of friction between the fibre and the pins, but not to the reduction of inter-strand friction. The addition of water also reduces dust formation, of course, but the results described under batching experiments show that the amount of emulsion added and the amount of oil in the emulsion can be reduced considerably below normal without serious loss in yarn quality.

6. Effect of batching oil on yarn strength.

(*a*) Ten yarns of various qualities (but all about 10 lb. grist) were soaked in batching oil and the strength of the yarns compared with that of untreated yarns. The cut-skein method was used. The results are given below. The quality ratios were calculated on the grists before treatment with oil, and hence are proportional to yarn strength.

Yarn Quality Ratios

Untreated	Oiled
87	94
74	78
108	113
63	67

Yarn Quality Ratios—Contd.

Untreated	Oiled
52	56
85	87
110	113
115	116
99	107
81	85
Means 87.4	91.6

There is an average increase in strength of about 5 per cent. in the oiled yarns. Any lubricating effect on interstrand friction that the oil may have is clearly outweighed by other effects.

(*b*) Yarns spun from the same jute treated with different batching emulsions so as to put (nominal) percentages of 2, 3, 5 and 7 per cent. of batching oil on the fibre were exposed for six months to indirect sunlight, with some short periods of direct sunlight. Exposure was on a verandah and wetting by rain was only occasional and slight. The strength after exposure was compared with that of (cut-skein) controls. The results were as follows:—

Nominal per cent. of oil on yarn.	Control strength lb.	Exposed strength lb.	Per cent. loss in strength	Per cent. loss in weight
2	9.49	6.24	34.3	3.3
3	9.20	5.67	38.4	3.5
5	8.96	5.26	41.3	4.3
7	9.39	5.44	42.1	6.8

The loss in strength on exposure increases with increasing percentage of oil. The loss in weight also increases; it may be due partly to loss of oil by evaporation and oxidation and partly to oxidation of the fibre, though the present data do not indicate the relative importance of the two effects.

In some other experiments it has found that removal of batching oil (along with natural fats and waxes) by solvent extraction decreases the loss in strength on exposure.

7. Other work

Further studies of the creep properties and torsional rigidity of single filaments of jute fibre have been made. The results of the former await examination and the latter work is being continued.

III ROUTINE SPINNING TRIALS

1. Raw Jute from Indian Union.

A number of 1947 crop samples were received through I.J.M.A.R.I. and these were spun to T.R.L. standard 10 lb. yarns with the following results.

Characters of 10 lb. yarns

TRL Ref. No.	Sample	Q.R.	Wt.C.V.	Percentage of cuttings removed
J 1945	Assam. Dhubri Middles ...	88	22	15
J 1947	Assam ...	63	26	12
J 1948	Assam. Dhubri Bottoms ...	81	28	20*
J 1951	Ditto ...	100	21	17
J 1954	Assam. Dhubri Middles ...	87	24	20*
J 1946	N. Bengal ...	64	26	14
J 1952	Haldibari Middles ...	90	22	16
J 1955	Ditto ...	83	24	20*
J 1956	Siliguri Middles ...	85	20	13
J 1965	N. Bengal. "Average quality" ...	75	23	nil **
J 1966	N. Bengal. "Best available" ...	87	23	nil **

*Not clean cut. Quality ratio might be a little higher if cut more heavily

**Apparently cut jute as received.

Of these samples only one (J 1951) is considered suitable for spinning alone to hessian warp.

Nos. J 1945, 1954, 1952 and 1966 could be mixed with Jat quality jute (that would give by itself a quality ratio of, say, 96 to 100 at 10 lb. grist) to the extent of 35 to 50 per cent. of the total for a hessian warp mix.

Nos. J 1945, 1948, 1954, 1952, 1956 and 1966 are suitable for spinning alone to hessian weft, though with J 1945 and 1955, admixture with a little jute of better quality would be desirable for a really good yarn.

No. J 1965 would spin to a 10 lb. sacking warp if mixed with about 10% of jute of better quality fibre. J 1946 and 1947 are of low quality but might do for ingredients of a sacking warp mix (requiring admixture with about an equal weight of jute giving Q. R. of about 90 to 95 at 10 lb. grist).

If these results are fairly typical it would appear that, except for hessian warp fibre, requirements might be met moderately well from North Bengal and Assam. The average quality ratio of the above eleven samples is 82 which is a little below what is required for a really good hessian weft; so, some admixture of better quality fibre would be necessary even for hessian weft.

2. J. A. R. L. Samples

The 1948 crop samples did not arrive until mid-March and consequently only a few were spun and tested during the year under consideration.

3. Madras Jute Trials

Twenty-five samples of jute fibre were received from agricultural officers in Madras province who conducted trials at the instance of the I. C. J. C.'s Director of Agricultural Research. Of these only three were large enough for standard spinning tests and they gave the following results when spun to 10 lb. yarn.

		Q.R.	Wt.C.V.
Agricultural College Farm. Veeravanam.			
	Capsularis	100	28
Ditto	Olitorius	93	27
Asstt. Paddy Specialist. Patambi.	Capsularis	87	25

These may be regarded as of good 'district' quality though the yarn irregularity is rather high.

The remaining samples ranged from 1 oz. to 10 lb. in weight and with one or two exceptions were of very low quality and all were short. Some were only a foot or two in length, some were tangled and others were badly retted. Some had been allowed to mature for seed.

IV. SPECIAL SPINNING TRIALS

1. Blending Experiments.

In some earlier experiments it was found that there was a difference between the quality ratios obtained with the mixed yarns from what would be expected from the quality ratios found for the ingredients if a simple mixture rule was applicable. Further trials have therefore been made in an attempt to get further information in this connection. So far only binary mixtures have been studied.

At present it may be said that the quality ratio obtained when two qualities of fibre are used in a mix usually agrees with that calculated from the simple mixture rule within about 5 units. For example if jute A gives a 10 lb. quality ratio of 105 and jute B a quality ratio of 80 and we use a mix of 60% A and 40% B, the quality ratio of the mixed 10 lb. yarn will be $\frac{(105 \times 60) + (80 \times 40)}{100}$, that is, 95. Sometimes the agreement with the result so calculated is fairly close but cases of a divergence of plus or minus 5 units do occur. Apart from differences due to random experimental errors, we have little or no clue as to the causes of the divergences from the simple mixture rule, and until such a clue is found we must make our calculations as in the above example. Thus if we have a sample of mesta that gives a quality ratio of 80 when spun alone to a 10 lb. yarn and we wish to add sufficient jute of good quality to bring the quality ratio up to 85 (suitable for an average hessian weft) and use jat jute that gives a quality ratio of 105 when spun by itself we may calculate the necessary percentage (x) as follows:—

$$\frac{105x + 80\,(100 - x)}{100} = 85$$

From which $x = 20$

To be on the safe side it may be wise to add a little more of the better quality of fibre than the amount so calculated.

Recent tests have given some indication that better results may be obtained by thorough mixing at the breaker feed rather than by mixing slivers at the back of the finisher, but the subject is a very complicated one and different relations may hold when different types of fibre are under consideration.

It is possible, and in agreement with results obtained recently in four series of trials, that the true curve obtained by plotting quality ratio (vertically) against percentage of better quality ingredient (horizontally) is often sigmoid in shape, being steepest at a point anywhere between 25% and 75% of the better quality ingredient. If this is confirmed, and some means can be found of knowing roughly where the inflexion will occur in a particular case (without conducting a series of spins on different mixtures), it should be possible to predict the characters of the mixed yarn with greater certainty.

Some cases have been met with where the blended yarn has shown a quality ratio greater than that of either of the constituents spun separately, but this is only when the difference in quality of constituents is small. The tendency is for the blend to give a yarn with a quality ratio less than the calculated value and this is understandable on the general view that mixtures of different qualities is liable to make for irregularity because blending is never perfect. Nevertheless there may be cases where one constituent supplies something that is lacking in the other. Coarse, stiff strands, even if strong, may give a yarn of rather low strength owing to a deficiency of inter-strand contacts; the addition of a proportion of 'soft' jute may add to the yarn strength by filling in the gaps, as it were, but to realise this effect blending must be thorough, and therefore should be done at an early stage of the spinning operations.

2. *Variation in Batching Procedure.*

Experiments have been made to see the effects on yarn quality of variations of the quality and composition of the emulsion applied. In some earlier work it was found that when water, without oil, was used in batching the quality of the yarn was reduced considerably and the number of yarn breaks in

spinning enormously increased. Yet it appears that the oil does not act by reducing interstrand friction. If a yarn is soaked in batching oil its strength is increased by some 5 per cent. and tests referred to elsewhere in this report show an increase of interstrand friction when oil is applied. The oil may however decrease friction between the fibre and the pins and may assist in the softening action of the water.

The recent tests indicate that the amount of water and the amount of oil applied (as emulsion) may be varied considerably without any marked effect on yarn quality. It is to be noted, however, that in these tests the emulsion was applied very uniformly (by spray) and the jute was binned for two days before carding. Atmospheric humidity was fairly high during spinning, that is, at about average Calcutta conditions (75% R.H.)

(*a*) *Variation of quantity of standard emulsion applied.*

(The results are shown in the table below).

	I. J 465. White Jute Per cent emulsion applied			II. J 797. White Jute Per cent. emulsion applied		
	10	02	30	10	20	30
Q.R. ...	74	78	76	73	70	70
Wt.C.V. ...	25	25	26	26	23	24

In these results there are hardly any significant differences in the yarn characters when different amounts of emulsion were used. Some differences are to be expected, but they appear to be so small that very exhaustive tests would be needed to show them up clearly.

(*b*) *Variation in percentage of oil in the emulsion.*

In these experiments the amount of oil in the emulsion was varied so that with 27% of emulsion actually going on the jute the amounts of oil taken up would be theoretically 2, 3, 5

and 7 per cent. In experiments on white and tossa jute the following results were found.

		J 796. White. Per cent. oil				J 796. White. Per cent. oil			
		2	3	5	7	2	3	5	7
Test 1.	Q.R. ...	101	102	98	99	80	81	84	79
	Wt.C.V....	19	20	22	22	23	26	24	24
Test 2.	Q.R. ...	—	—	—	—	85	83	83	74
	Wt.C.V. ...	—	—	—	—	22	23	20	22

The general indication is of a slight falling off in quality ratio when the percentage of batching oil is as high as 7%. This is understandable, because the weight of the oil contributes to the value found for the grist. Under the conditions of the experiments it appears that, given uniform application, good spinning performance can be obtained with 2 or 3 per cent. of oil and as little as 10% of water on the weight of the jute. More water would be necessary under dry conditions and may also be desirable for the prevention of dust formation.

The disadvantages of adding a high proportion of oil are (*a*) darkening of the colour of the cloth, (*b*) some lowering in strength for a given weight, (*c*) increase in unpleasant smell, (*d*) marking off of oil on the wrapping paper or other goods, or contamination of contents of sacks and bags, (*e*) greater loss in strength on exposure to light and air.

Oil is cheap and may be added for weighting purposes, but the effects just referred to must be borne in mind. When it is added for weighting it may be desirable to apply it after carding because much is probably lost along with the bark.

3. Fine Yarns.

The tables herewith show the results obtained in spinning a range of fibre samples to both 10 lb. and 3 lb. grist. The

fine spinning system was used for the 3 lb. yarns. The results for white jute are plotted in Fig. 2. The graph shows that a moderately good idea of the spinning quality at 3 lb. grist may be obtained from the results at 10 lb. grist. In order to see if it would be an aid to the prediction of the quality ratios obtainable at 3 lb. grist the bundle torsional rigidity of all the samples was determined but the results were found to be of little assistance. Average reed weight per metre may be of greater help.

Quality Ratios at 10 lb. and 3 lb. Grist
White Jute.

		Q. R.	
Ref. No.		10 lb.	3 lb.
J 658	...	123	88
J 1075	...	122	92
J 1102	...	107	79
J 1038	...	104	73
J 1875	...	104	75
J 1138	...	104	75
J 1869	...	103	66
J 1101	...	99	66
J 1919	...	98	65
J 1035	...	97	70
J 1104	...	97	74
J 161	...	97	73
J 1082	...	97	67
J 1886	...	94	65
J 1925	...	91	66
J 1927	...	85	59
J 1881	...	82	53
J 1887	...	76	45
J 1901	...	71	26

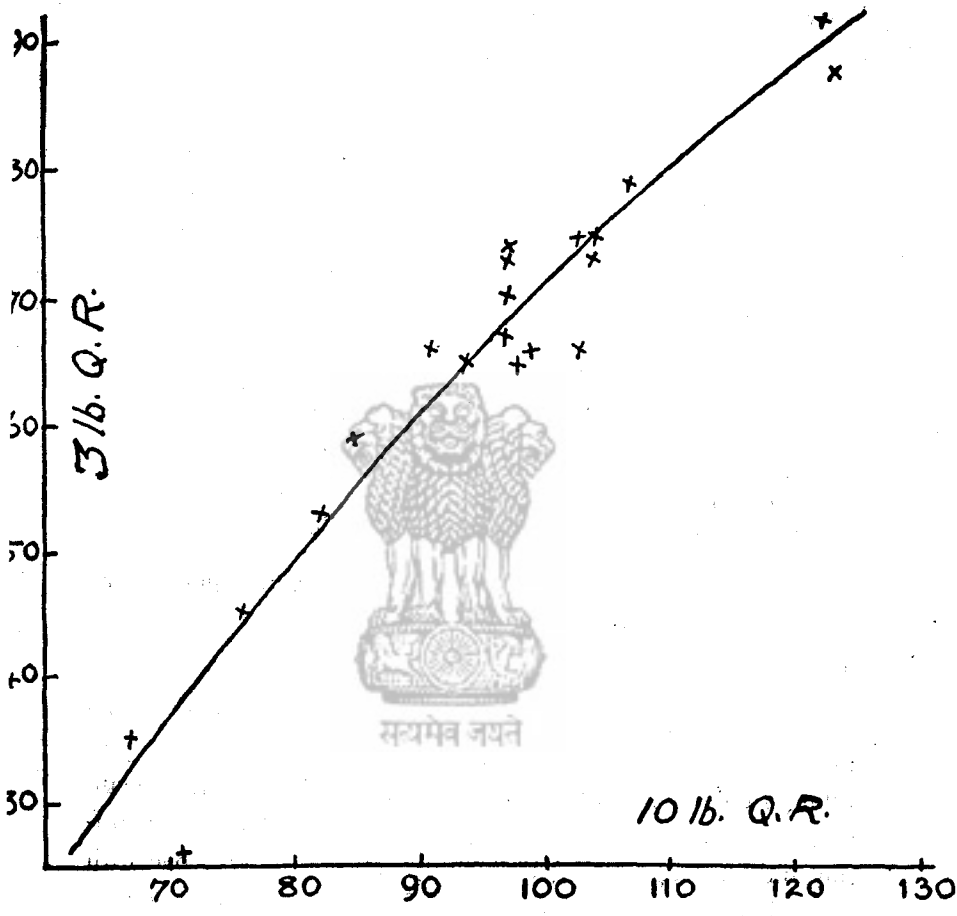


Fig. 2

Quality Ratios at 10 lb. and 3 lb. Grist—(Contd.)

Tossa Jute.

Ref. No.		Q. R.	
		10 lb.	3 lb.
J 1903	...	67	35
J 1037	...	117	81
J 1036	...	116	73
J 1657	...	106	66
J 1659	...	105	77
J 1658	...	104	78
J 1661	...	104	73
J 1660	...	96	67
J 1738	...	92	66
J 1739	...	88	62

It appears that the highest qualities of white jute are as good as, or even better than, high quality tossa jute for spinning fine yarns.

If the quality ratio of a 3 lb. yarn is below about 80 the number of yarn breaks tends to be high (more than 2 or 3 in filling 8 bobbins) and the yarn strength may also be inadequate and the yarns irregular, causing too many breakages in winding and weaving. To get a quality ratio of 80 or above with white jute at 3 lb. grist it appears from the curve that, on an average, fibre good enough to give a quality ratio of 110 or above at 10 lb. grist is required and if the fibre is fine and free from faults this is probably a satisfactory criterion, though to be on the safe side jute giving a 10 lb. Q. R. of 115 to 120 may be used. With tossa jute it appears necessary to use only the very highest qualities for 3 lb. yarns (that is, jute that gives quality ratios of 115 to 125 at 10 lb. grist).

A note on this Subject was published in *Jute Bulletin* (October, 1948, p. 249).

V. TESTS ON COMMERCIAL YARNS.

Fifty two samples of sacking weft yarns from Calcutta mills were tested for grist, strength and irregularity. The

results were given in full in *Jute Bulletin*, Vo. II, No. 11, p. 438 (February, 1949). In this work irregularity was determined with the length of the cuttings adjusted as described in T. R. Circular No. 1, p. 53, namely:—

Grist	Length of cuttings
21 to 24	3.00
25 to 28	3.25
29 to 32	3.50
33 to 37	3.75
38 to 42	4.00
43 to 47	4.25
48 to 53	4.50

The results may be summarised as follows:—

	Below 30 lb. grist	30 to 40 lb	Above 40 lb
Number of samples ...	16	29	5
Average grist ...	26	35	47
Average breaking load (lb) ...	13	18	22
Average quality ratio ...	49.5	51.4	48
Range of quality ratio ...	38 to 60	41 to 66	40 to 52
Average Wt. C. V. ...	36	32	31
Range of Wt. C. V. ...	29 to 45	26 to 39	26 to 38

The wide range of quality, both as regards strength and irregularity, is very striking.

A method of grading sacking weft yarns, based on the results obtained, is as follows:—

Grade	Q. R.	Wt. C. V.
1	65 or over	below 29 (a)
2	60 to 64.9	23 to 31 (b)
3	55 to 59.9	25 to 33 (c)
4	50 to 54.9	27 to 35 (d)
5	45 to 49.9	30 to 38 (e)
6	40 to 44.9	34 to 44 (f)
7	below 40	above 39 (g)

If the Wt. C. V. corresponds with the primary grading on the basis of quality ratio we get the grade straight away. For example, a sacking weft yarn with Q. R. 47 and Wt. C. V. 37 would be ranked as Grade 5.

If, however, it is necessary to go to a line above or below to find a Wt. C. V. range that includes the observed value we may add a letter after the grade number. It is important to go up or down only as far as the first line that contains the required Wt. C. V. range. Thus Grade 4 would indicate that we had to go to the line below (30 to 38 Wt. C. V. range) to find a range including our observed value, and so on. Further discussion will be found in the issue of *Jute Bulletin* referred to.

VI. JUTE SUBSTITUTES.

During the year further samples of linseed flax fibre, mesta and roselle were received. The linseed fibre was found to spin well in admixture with jute to 10 lb. yarns. For example, 8 slivers of jute and 4 slivers of the linseed fibre fed at the back of the finisher card gave a 10 lb. yarn of quality ratio 90, the jute by itself giving a quality ratio of 100. This was a carefully prepared sample received from the Harcourt Butler Technical Institute, but no doubt much of the linseed flax fibre which might be made available is of similar quality. The flax was batched with oil only (2 to 3%).

A summary of the information gained in Technological Research Laboratories regarding the quality of a number of jute substitutes has been submitted separately. Some of the more important points are given below.

Mesta.

This fibre (from *Hibiscus cannabinus*) is no doubt the most important substitute in India at present, and the one that could be developed most rapidly. It is known by various names, including Bimlipatam jute, Ambari, Deccan hemp, Bombay hemp, Gambo, brown hemp and kenaf, though some of these names are applied to other fibres also. At present it

is largely cultivated as a cover-crop or a border crop, as well as a pure crop. It is said not to stand up to water-logging and to grow well on soils of only moderate fertility. Production appears to have fallen off in recent years.

Jute gives a larger yield per acre and in considering more extensive cultivation of mesta it is most important to consider also the relative importance of available land for jute production and food production.

The average quality ratio in 10 lb. yarns obtained with 8 samples of mesta was 80, the values ranging from 72 to 85. The fibre is therefore not quite suitable for spinning by itself to hessian yarns, but it might do for sacking warp if spun alone.

It could be spun with an equal quantity of fairly good jute (that would give Q. R. 90 in a 10 lb. yarn) for hessian weft yarns and it is believed that if 25% were used with 75% of jute that gives a quality ratio of 100 to 110 in a 10 lb. yarn, a hessian warp of average quality could be spun, but with ordinary good to medium white jat jute probably only 10 to 15 per cent. of mesta of average quality could be used for this purpose.

Roselle and Urena.

Samples of these fibres that have been tested in Technological Research Laboratories gave weaker 10 lb. yarns than average mesta and there seems to be nothing to recommend their production in preference to mesta, unless local conditions are, in some cases, particularly favourable. For best quality early harvesting is desirable.

General.

There are many other fibres with considerable possibilities as substitutes but their performance is in some cases not well known and extensive cultivation would take some years to develop. Such fibres are bhendi, *Sida*, *Marsdenia*, *Malachra* and giant nettle (*Girardinia*). In many cases there is some disadvantage, such as the presence of stinging hairs, branched habit of the plant, low yield per acre and so on. It would be

well therefore to concentrate for the present on developing mesta, though it may be also of great importance to find a substitute that can be used for good hessian yarns, particularly hessian warp.

Ramie or rhea hardly comes up for serious consideration as substitute. Costs are high and its proper field of use is not for baggings and the like. True hemp is a strong fibre, in some ways intermediate between flax and jute. Cultivation in India is at present restricted but if it were available in quantity it could be used along with jute on ordinary jute machinery. It does not require the same batching treatment, though damping and the addition of a little oil before carding may be beneficial. Owing to its strength it may not break down sufficiently in the breaker and a special pre-treatment may be necessary.

Sunn hemp varies greatly in quality. The average quality does not spin well on jute machinery to medium counts. The finer qualities might be mixed with jute for hessian weft or sacking warp. Production has gone down in recent years.

Some varieties of bow-string hemp spin well on jute machinery to 10 lb. yarns, producing a very strong, but rather hairy yarn.

VII. JUTE CHEMISTRY.

1. Chlorite Bleaching.

A paper describing some of the investigations carried out was published in *J. Text. Inst.*, 39, T 274—281 (August 1948). Suitable conditions are treatment for several hours at about 60°C and pH5, but a relatively high available chlorine content is required to produce a high colour. A solution containing 0.5% of sodium chlorite is suitable. Costs are at present high but they may be expected to fall, as they have done in the case of hydrogen peroxide and other chemicals that were once more or less curiosities.

When a chlorite treatment is the only bleaching operation the colour is far from permanent and shows rather rapidly yellowing on storage or exposure. A preliminary alkaline steep may produce a more permanent result, by removing easily degradable constituents, but only at the expense of a considerable reduction in strength.

2. Hydrogen Peroxide Bleaching.

Some promising results have been obtained in preliminary work on the bleaching of jute yarns with peroxide solutions. Using solutions of half to one volume strength it is possible to obtain a fairly high colour with retention of over 70% of the wet strength. Since the treatment is an alkaline one it may be expected that the colour will be more permanent than when an oxidising treatment only is employed. This point remains to be studied.

Some 50% of the wet strength may be retained, with the production of a fairly high colour (but all speck not killed) by using a chlorite treatment (0.5 per cent. solution) followed by a peroxide treatment (half volume strength). The colour obtained is expected to be much more permanent than a similar colour obtained by treatment with chlorite or hypochlorite only.

3. Jute Fibre Hemicelluloses.

A paper describing the results then available was published in *J. Text. Inst.*, 39, T 44-58 (February, 1948). The work has since been continued. The hemicelluloses extracted from jute holocellulose, obtained by the chlorite method, by means of cold dilute caustic soda could be separated into two parts, one soluble in 50% alcohol and the other insoluble. The latter consists mainly of xylose units, some of them apparently combined with uronic acids. The soluble portion may consist chiefly of hexose units, but apparently, as shown by paper chromatographic tests on the hydrolysate, the hexose is not glucose. No arabinose could be detected by paper chromatography in the hydrolysate of jute hemicellulose.

4. Hemicelluloses in relation to rot-proofing.

A thorough knowledge of the hemicelluloses of the fibre, besides being very important in relation to bleaching, may suggest methods of rot-proofing. The hemicelluloses contain acid groups (carboxyl groups) in which the hydrogen is partly replaced by metals such as calcium and partly, it is thought, by lignin groups. Treatment with dilute caustic soda sets free many of the carboxyl groups, with an accompanying considerable increase in the acid value of the fibre. By immersing the alkali-pretreated fibre in a solution of a copper salt, copper may be introduced in place of the hydrogen of the carboxyl groups. Some half to one per cent. of copper on the weight of the fibre may be thus introduced and it is of interest to see if its presence confers rot-proofness on the material, especially as it is found that the copper is not easily removed by prolonged washing with water.

In one experiment a 10 lb. yarn treated on the lines indicated still had a quality ratio of 73 after burial in the soil for two months whereas an untreated control pad lost nearly all its strength (quality ratio 8.4). In another experiment after three months' burial the untreated yarn had completely perished whereas the treated yarn still had a quality ratio of 57. In the first case 0.87 per cent. of copper still remained on the yarn after burial and in the second case 0.51%.

5. Methylene Blue Absorption.

After the completion of the studies previously referred to an account of the work was published in *J. Soc. Dyers and Colourists*, 1948, 64, 218-221.

VIII. MISCELLANEOUS WORK

1. Waste in Spinning and Weaving.

Records have been kept in T.R.L. of the amount of waste deposited below the cards but on account of the small scale on which the routine spins are made it was not found useful to try to get similar data for the later operations.

An attempt was made to draw up a scheme for losses in processing (*Jute Bulletin*, December, 1948, p344) and comments on the provisional figures would be welcome.

2. Sugar Bags.

The application of 0.5% pentachlorophenol to the cloth used for sugar bags was found to delay syrup formation by about one month. Partial bleaching of the cloth and the application of formaldehyde to the cloth were less effective. Similar trials are proceeding with small bags treated with other antiseptics, including shirlan and benzoic acid.

3. Deterioration of jute on exposure and in soil burial.

Some exploratory work has been done to study effect of natural fats and waxes and of batching oil on the loss in strength of jute fibre and jute yarns when exposed to the weather or buried in the soil.

4. Impregnation of bleached jute yarns with synthetic resins.

Several sets of samples submitted by Dr. J. K. Chowdhury have been tested for strength and grist. The samples totalled over one hundred.

सत्यमेव जयते

IX. VISITORS

Visitors who came to the Laboratories during the yea include the following :—

Mr. E. Nelson	...	U. S. Government Department of Agriculture. Washington, D. C.
Sir S. S. Bhatnagar, F.R.S.	...	Director, Scientific & Industrial Research.
Mr. S. M. Srivastava	...	Ministry of Agriculture, New Delhi.
Dr. D. R. Dhingra	...	Harcourt Butler Technical Institute, Kanpur.
Mr. Norris E. Dodd	...	Director General, United Nations Food and Agriculture Organisation.
Sir Datar Singh	...	President, I. C. J. C.
Mr. I. G. Kennedy, C.B.E.	...	Vice-President, I. C. J. C.
Mr. P. S. Gupta	...	Director of Supplies, Ministry of Industry and Supplies.
Mr. F. Ashmore	...	Director of Inspection, Department of Industry and Supplies.
Mr. Atrisha	...	Secretary, Patents Advisory Committee.
Mr. John Page	...	Director, Messrs. Fairbairn, Lawson, Combe Barbour.
Mr. C. O. Tattersall, O.B.E.	...	Imperial Chemical Industries.

also, members of Cottage Industries Committee of D. G. I. S.

X. STAFF

Mr. A. S. Gillies, Manager, left in May, 1948, as noted in the introduction. Mr. B. K. Chakrabarti, Junior Research Assistant (Physicist) left in January, 1949, to take up a post with the Government of West Bengal. Mr. P. R. Mukherjee was appointed Librarian in succession to Mr. A. K. Sur. Some

changes occurred among the Junior Testers. A list of the staff is appended :—

Director	... Mr. C. R. Nodder, O.B.E., M.A. (Cantab)
Manager	... Mr. A. S. Gillies, A. T. I., F.R.S.A. (on leave)
Senior Research Physicist	... Dr. K. R. Sen, D.Sc.
Senior Research Chemist	... Dr. P. B. Sarkar, D.Sc., F.N.I.
Junior Research Assistant (Physicist)	... Mr. B. K. Chakrabarti, M.Sc.
Junior Research Assistant (Chemist)	... Dr. H. Chatterjee, M.Sc., D.Phil., F.R.I.C.
Head Tester	... Mr. S. B. Bandyopadhyay, M.Sc.
Senior Tester	... Mr. S. R. Guha, B.Sc.
,,	... Mr. A. K. Mazumdar, B.Sc. (Hons)
,,	... Mr. S. K. Bose, B.Sc.
Statistical Clerk	... Mr. S. K. Mukhopadhyay, B.Sc.
Junior Tester	... Mr. U. Chatterjee, B.Sc.
,,	... Mr. K. B. Pal, B.Sc.
,,	... Mr. S. R. Das, B.Sc.
,,	... Mr. H. Ghosh, B.Sc.
,,	... Mr. S. K. Guha, B.Sc.
,,	... Mr. B. K. Bose, B.Sc.
,,	... Mr. S. S. Bhattacharjee, B.Sc.
,,	... Mr. N. K. Sil, B.Sc.
Electrician	... Mr. R. K. Bhattacherjee.
Librarian	... Mr. P. R. Mukherjee, B.Sc. (Hons)
Head Clerk	... Mr. T. C. Chakraburtty.

Subject	Progress	Future work
II. Background Research.	1. The tensile strength of twisted standard bundles made up from lightly combed fibre and its relation to spinning quality has been studied. This physical fibre character gives good promise of being useful for assessment of quality. Bundles given an S-twist, instead of the usual Z-twist used for yarns, showed significantly higher strength.	1. It is desirable to continue the work, using further samples of white and tossa jute.
	2. The torsional rigidity of the bundles employed in the above tests was also determined. The multiple correlation coefficient for strength and rigidity against yarn quality ratio was only slightly higher than the correlation coefficient for strength against yarn quality ratio. If the strands are stiffer they will be likely to form a less compact assemblage, both in the yarn and in the bundles, and possibly, for this reason, the effect of stiffness is sufficiently taken care of in the tensile strength tests.	2. If the bundle-strength method is adopted there may be little object in including bundle torsional rigidity as a character for prediction of spinning quality.
	3. A new method has been worked out for the estimation of the fineness of fibre-strands in yarns. The results obtained agree reasonably well with the values calculated from the dimensions of the botanical fibre-	3. The method might be applied to slivers and roves and in a study of the break-down of the strands during carding and preparing.

bundles. The strands seen in a section may be parts of a branched or meshy structure and simple strands, even if coarser, may be associated with better spinning quality than more complex strands with fine branchings.

Difference in strand fineness and complexity between white and tossa jute should receive further study.

4. Tests and calculations for 30 samples of white jute have been completed in the investigations on the relations between physical fibre characters and spinning quality. Complete data for nine characters are now available and the multiple correlation coefficient for these nine characters is found to be 0.961, as compared with 0.953 reported last year for seven characters.

4. Investigations should be made with the object of finding some method of improving the prediction of yarn irregularity. A similar investigation remains to be completed using tossa jute samples.

5. Interesting results have been obtained in a study of the frictional characters of the fibre, using two pads of fibre and an inclined plane, as previously described.

Batching oil does not appear to reduce interstrand friction, but rather to increase it. Deposition of paraffin wax on the fibre reduced friction.

Tossa jute tends to show a lower coefficient of friction than white jute when examined by

5. The results suggest an investigation of the precise role of batching oil in the emulsions used in practice. In the first place its effect on the stiffness of the strands may be investigated. Other points for investigation are the effects of oil on friction between fibre-strands and pins and its effect, if any, in helping longitudinal splitting of the strands.

Subject	Progress	Future work
	this method, in spite of a lower natural fat and wax content. This may be connected with a simpler strand structure in Tossa fibre. It is known that omission of oil in batching results in poor spinning performance but the part which it plays is not clear.	
	6. When yarns (ten different qualities) were soaked in batching oil an average increase in strength of about 5% was found. This indicates that any effect the oil might have in reducing interstrand friction is masked by other effects.	6. Further work may be done to see the effect of batching oil on the deterioration of yarns on exposure.
	Any increase in the amount of oil used in batching results in an increase in the loss of strength suffered by the yarn on exposure. Loss in weight on exposure also increases with the amount of batching oil applied.	
III. Routine Spins.	1. The results of spins on a number of samples of raw jute from the Indian Union are reported. One sample from Assam was judged to be of jat quality, with Q. R. 100 and Wt. C. V. 21. The 10 lb. yarn quality ratio of the other ten samples ranged between	1. Tests on further samples are in view.

	63 and 90. Several of the samples were judged suitable for spinning alone to hessian weft and others could be used with jat jute for hessian warps.	
	2. J. A. R. L. samples. These did not arrive in time for more than a few to be spun in the year under consideration.	2. This important routine work must continue as required.
	3. Madras Jute Trials. Of 25 samples received only three were large enough for a spin. These were of average 'district' quality, though the 10 lb. yarns were rather irregular. Of the other small samples only two or three seemed to be of fair quality. The others were very short, and some were greatly tangled, under-retted or very faulty. A report based on a hand-and-eye examination has been submitted.	
IV. Special Spinning Trials.	1. Blending Experiments. Several further trials have been made in order to see how the characters of the blended yarn compare with those of the ingredients spun separately. The results obtained give useful pointers for more extensive trials.	1. Much further work on similar lines remains to be done, particularly to compare different methods of blending (*e.g.*, at breaker card, at finisher card, or at drawings) and to see if any general principles can be found that will assist in the choice of fibre for blends. More work is required to see whether the curve

Subject.	Progress	Future work
		obtained by plotting composition against quality ratio is sigmoid in shape in the case of binary blends.
	2. Variation in batching. The results of a number of trials indicate that, given uniform application of a good emulsion and a relative humidity approximating to average Calcutta conditions, and provided that the batched fibre is binned or piled before carding, the spinning performance is not very sensitive to the amount of oil or water used. The amount of water added in practice must depend largely on the amount of evaporation expected to occur during processing and the amount of oil used in excess of 2 or 3 per cent. may be determined by cost and weight considerations, as well as such factors as colour of the cloth, smell, marking off on to wrapping papers, etc., contamination of the contents of bags, loss in strength on exposure, etc.	2. Further similar trials may be made.
	3. Fine Yarns. Results are given showing the yarn Q.R.'s and Weight C. V.'s obtained when various samples of fibre were	3. Further work on these lines is not considered urgent at present.

	spun to 10 lb. yarn and 3 lb. yarn. In general the results obtained at 10 lb. grist are a fairly reliable indication of what may be expected at 3 lb. grist. The best qualities of white jute are quite as suitable, and perhaps more suitable, for spinning fine yarns as the best qualities of tossa.	
V. Tests on Commercial Yarns.	Fifty-two sacking weft yarns from various Calcutta mills were tested for grist, strength and Wt. C. V. The results have been reported. A method of grading, based on the results, has been put forward.	Further similar tests on other types of yarn are desirable.
VI. Jute Substitutes.	Some samples of linseed flax fibre, mesta and roselle were spun. Mesta though inferior to jute, is considered to be the fibre most suitable for rapid development for the purpose of supplementing jute supplies. A note on the information gained in Technological Research Laboratories regarding jute substitutes has been prepared.	In view of present jute supply difficulties it is desirable that as many samples as possible of promising substitutes should be sent to Technological Research Laboratories for spinning trials, particularly of fibres that can be produced on land not required for jute or food production.
VII. Jute Chemistry.	Further progress has been made in the study of the hemi-celluloses of the jute fibre. Paper chromatographic methods have been used in the examination of the constituents.	Work may continue on similar lines.

Subject.	Progress	Future work
	The introduction of copper, to replace the groups which are combined with the uronic acids of the hemi-celluloses in the untreated fibre, was found to confer a considerable degree of rot-resistance. Experiments have been carried out on yarn bleaching by means of hydrogen peroxide and by chlorite or hypochlorite treatments followed by a peroxide treatment. Hydrogen peroxide baths of low alkalinity appear to be very suitable for jute bleaching and if this treatment is used as the final stage of a bleaching process it may be expected that after-yellowing will be reduced. Results of storage and exposure tests are, however, awaited.	
VIII. Miscellaneous.	1. Data recorded in Technological Research Laboratories for the waste falling below the cards, together with probable values for other losses, have been used as the basis for an attempt to assess likely overall losses or gains in manufacture.	1. Checking of the tentative figures by data obtainable from mills is desirable.
	2. Further experiments on the storage of sugar in treated bags were carried out. The application of 0.5% of pentachlorophenol	2. Further work is necessary.

	delayed syrup formation for about one month when the bags containing sugar were stored in a moist atmosphere.	
	3. Various tests have been made to see the effects of yarn treatments on loss in strength on exposure or burial in the soil.	3. May continue.
	4. Very numerous tests were made on yarn samples sent by Dr. J. K. Chowdhury.	4. May continue if required.
IX. Grading.	One meeting of the Grading Sub-Committee was held during the year and a further scheme was arrived at, providing for the separation of present Bottoms into two grades.	
X. Moisture Relations.	A special Sub-Committee was appointed and held one meeting during the year. It was decided to purchase an electronic moisture-meter. The Sub-Committee decided that it was necessary to collect further all-the year-round data regarding the regains of jute offered for sale before definite steps could be taken to set up new standards.	Further data may be collected.
XI. New Uses.	It was not found possible during the year to fit in any work specifically aimed at finding new uses for jute. The work on the chemistry of the fibre is however providing information of a fundamental nature that is very important in this connection.	Work on the use of jute in combination with wool, as in ply-yarns, remains to be done.

APPENDIX III

ANNUAL REPORT OF THE ECONOMIC RESEARCH SECTION FOR THE YEAR 1948–49

During the year under review, the Economic Research Section was under the charge of Mr. K. C. Basak, Director of Economic Research, who had also to carry on the duties of the Statistical Officer as the post was not permanently filled up. Since the amalgamation of the Marketing Section of the Committee with the Economic Research Section in December, 1947, the work of the latter Section has increased considerably. Three permanent Assistants of the section, who had received considerable training in the types of work done in the Section, resigned their posts to take up better positions elsewhere. The loss of such experienced hands, as has been going on for several years past, considerably affects the research activities of the Section.

The sanctioned programme of work of the Section for the year 1948-49 was as follows:—

(*i*) Investigation into the economics of jute growing.
(*ii*) Study of mofussil prices of jute and other statistics.
(*iii*) Study of jute substitutes.
(*iv*) Statistical analysis of data on physiology of jute.
(*v*) Revision of two Marketing Reports.
(*vi*) Dissemination of Calcutta Loose Jute Prices to the mofussil centres.

Besides the sanctioned programme, a number of *ad hoc* enquiries were undertaken to study some specific problems of jute which cropped up during the year under review. Of these the most important one was a comprehensive survey of transport conditions relating to the movement of raw jute.

A summary of work done during the period under review is given below.

INVESTIGATION INTO THE ECONOMICS OF JUTE GROWING

It may be recalled that this investigation was first undertaken at the beginning of 1945 and that up to the end of 1947, *i.e.*, during the first three years, the investigation was carried

out entirely in a few selected jute-growing centres of East Bengal. Since 1948, however, all the five centres of investigation have been shifted to the Indian Union and distributed among the major jute-growing provinces of the Union.

RESULTS OF THE 1947 INVESTIGATION

A brief resume of the field work done in 1947, the last year of investigation in East Bengal, was given in the last annual report of the Economic Research Section. The detailed report of the findings from that year's investigation was prepared in the first half of 1948 and considered by the Committee at its meeting held in July 1948. The report led to some important conclusions which are summarised below:—

(*1*) Jute cultivation in 1947 was fairly profitable on account of high prices of the fibre, and the average farmer under the investigation made a total profit of about Rs. 105/- from jute.

(*2*) This profit was, however, practically eaten up by the inflationary rise in prices of food and other articles which the farmer had to buy to maintain himself and his family. As a result, it was found that the standard of living of the average farmer in 1947 was hardly better than that in 1945. Thus the profit margin is not a true index of the living condition of the farmer under inflationary conditions.

(*3*) It follows from these findings that the question of a fair price for jute involves the consideration of both cost of production and cost of living of the jute grower.

(*4*) The method and technique of investigation evolved in course of the first three years' work in East Bengal gave results which when tested statistically were found to be satisfactory on the whole.

(*5*) The method of forecasting the cost of production of jute gave a fairly good estimate of the average cost for 1947.

INVESTIGATION IN 1948-49

As already mentioned, the five centres of investigation were shifted to the Indian Union after the partition and several villages were selected at the following places:—

West Bengal	— (1)	Belakoba (Jalpaiguri).
	(2)	Monoharpur (Hooghly).
Bihar	— (3)	Purnea.
Orissa	— (4)	Kendrapara.
Assam	— (5)	Rupohi.

Considering the wide scatter of the farms and also for an intensive study of the problems involved, the number of farms selected at random at each centre except Kendrapara was 40. At Kendrapara the number had to be reduced to 29 on account of various difficulties. The whole work of organising the centres and training up of the new field staff and the farmers under investigation had to be done afresh. Various difficulties were encountered both in the organisational work and in the work of actual investigation. Most of these difficulties were not experienced in previous years.

The centres were surveyed thoroughly from all economic aspects with particular reference to jute, and reports of the general economic survey of the centres were prepared. An exhaustive enquiry was made into the cost of production of jute and paddy plot by plot, the total number of plots in the five centres thus investigated being 2,000. A thorough investigation into the causes for the variation in cost and yield was made. The economic condition of the farmers was also investigated from their income and expenditure, and a detailed study of the family budget of the farmers was made for ascertaining the importance of the different items of expenditure. It is proposed to pursue this particular line of enquiry in greater detail in future which would enable us to work out a weighted cost of living index of the farmers.

A comprehensive report of the investigation for 1948-49 is under preparation which will be placed before the Committee at its meeting to be held in July, 1949. Some important conclusions drawn from the investigation on jute are summarised below:—

(*1*) Human labour accounted for about 85% of the total operational cost and cattle labour for another 11%. Therefore, availability of labour is a very important consideration for the extension of jute cultivation.

(*2*) Only 2% of the cost was spent on manure which was extremely inadequate for increasing the yield.

(*3*) Weeding is the most important operation for jute, which accounted for 40% of the total human labour spent. Cost of production of jute can be considerably reduced by the introduction of mechanical devices for weeding.

(*4*) Hired labour plays an important role in jute cultivation. Of the total human labour employed 45% was hired.

(*5*) Cost of production of jute showed wide variation from centre to centre. The main reasons for such variation were wide difference in wage rates, large variation in yield due to both permanent and temporary causes and, finally, difference in the input of labour, both human and cattle.

(*6*) The consequences of such wide variation in cost were that in three centres out of five the accounts of the average farmer showed a net profit on jute, while in the other two centres there was a net loss on jute. The over-all weighted average figures for all the five centres, however, gave a small margin of profit.

STUDY OF MOFUSSIL PRICES OF JUTE AND OTHER STATISTICS

By August, 1948, final selection of markets and villages in all the 5 centres selected for the investigation into the economics of jute growing was complete and the work of the Scheme was commenced. As the services of the same field staff engaged in the Scheme for Study of Economics of Jute Growing were utilised in this connection, it was essential to

see that the progress of work of the principal scheme did not suffer. Selection of places therefore had to be made from this point of view and the programme of the staff adjusted accordingly. The 5 centres where this scheme was in operation are Monoharpur, Belakoba (West Bengal), Rupohi (Assam), Gulabbagh (Bihar) and Kendrapara (Orissa).

Prior to final selection of markets and villages, preliminary surveys were undertaken by the field staff in order to select suitable places. Having done that, balers were approached with the request to extend their co-operation in furnishing the required information from time to time to which fairly good response was received.

The marketing season commenced at different times of the year at different centres and collection of data was started accordingly. Of these centres Rupohi was the earliest and Kendrapara the latest to commence marketing operations. By November, 1948, however, the scheme was in full operation in all the 5 centres.

Four sets of forms were used for collection of necessary data. The first set relates to the secondary market (baling centre) and gives balers' stock, purchase, shipment, grade outturn and price. The second set gives price and grade outturn in *hats* and primary markets while the third set gives the same information for villages. As information regarding grade outturn at villages and primary markets is not available, our investigators estimate it on a sampling basis. Various items of handling, transporting and marketing costs are shown in the fourth set of forms which is not required to be filled in as frequently as the other three sets. The data thus collected were tabulated at the headquarters and averages were worked out for further analysis.

It was, however, found that transactions in villages and primary markets particularly in Rupohi (Assam), Belakoba (West Bengal) and Purnea (Gulabbagh) centres had practically come to a close by the middle of February 1949. Secondary markets in all the centres were till then operating but by the middle of March, 1949 transaction in these markets too

declined considerably. Thereafter, transactions gradually dropped at Monoharpur (West Bengal) and Rupohi (Assam).

A full report on the scheme will be placed separately for the consideration of the Committee at its meeting to be held in July 1949.

JUTE SUBSTITUTES

This subject has been under constant study in the Economic Research Section. During the period under review a large volume of information on substitutes was collected which is being summarised and classified. All this information was made use of in revising the chapter on jute substitutes in the Second Marketing Report.

Some preliminary analysis of the data and information collected so far has also been made. It shows that the problem of substitutes is not simply one of price relationship between jute and its rivals. For instance, the *Urena lobata* fibre known as Congo Jute has a lower yield than the average yield of jute proper. Its current price is also much higher than that of jute. Yet the production of Congo Jute is steadily increasing in Belgium Congo. To give another example, the consumption of paper bags in U. S. A. has increased considerably, but at the same time U. S. hessian consumption in the post-war period also shows substantial increase over the pre-war average. While paper bags compete with jute bags, jute boards in their turn compete with paper boards in the U. S. A.

Thus the competition between jute and its substitutes in the post-war period is the resultant of a number of factors, of which the following appear to be the most important:—

(1) Price factor.
(2) Supply position.
(3) Tendency towards self-sufficiency.
(4) Technical changes and legal restrictions in the method of packaging goods.

A detailed study is also being made of the progress of substitutes in the Latin American countries. The recent report of the possibility of growing kenaf on a large scale in Cuba and El Salvador has been examined in the light of information

available with us. From the results of experiments carried out in Cuba it appears that the large-scale cultivation of kenaf in Cuba and El Salvador presents the following difficulties:—

(1) Retting and hand-stripping of the fibre is uneconomical due to high labour costs.

(2) Experiments on mechanical decortication and mechanisation of harvesting of kenaf have shown that the fibre produced is not equal to jute in quality for spinning. The quality of the decorticated fibre is also inferior to the quality of a retted hand-stripped fibre.

(3) The decorticated fibre slows down spinning, is dirtier and results in a weaker fibre than jute.

PLANNING FOR INCREASED JUTE PRODUCTION

A comprehensive report on the different aspects of planning for the increased production of jute was prepared for the meeting of the Planning Sub-Committee held in December, 1948. The following are the salient points of the report:—

(1) The short term and long term targets of jute production in the Indian Union were estimated at 34 lakhs of bales and 70 lakhs of bales respectively.

(2) In the season 1948-49 the average yield per acre in the Indian Union increased very slightly, so that the increase in output of 19.5% was mostly accounted for by the 17.5% increase in acreage. Only in West Bengal and Assam there was some increase in yield, but all other jute growing provinces and states in the Indian Union recorded lower yield per acre.

(3) West Bengal, which had to its credit the maximum increase in output, would have done still better if the growers had sown jute on licensed land to the full.

(4) It has been noted that even the short term target for jute would be difficult to reach within the limitations set by the urgent demands for food production, unless the yield per acre is raised

substantially by a large supply of heavy yielding jute seeds of improved variety.

(5) Shortage of Labour, particularly in Assam and Bihar, is another difficulty standing in the way of increasing the jute acreage. In the given circumstances, high yield per acre is the only way out of the difficulty.

(6) High prices of jute as a direct incentive to the growers are playing a dominating role in the present inflationary situation. But they also tend to reduce consumption of jute and jute goods in foreign countries. This dilemma can be solved only if the anti-inflationary measures initiated by the Government are successful.

STATISTICAL ANALYSIS OF DATA ON PHYSIOLOGY OF JUTE

In pursuance of the decision of the Committee, the Statistical Analysis of Prof. Sen Gupta's data on Physiology of Jute for the years 1946-47 and 1947-48 was undertaken by the Director of Economic Research. A small part of the data for 1947-48 had been analysed early in 1948 and a report of the findings was submitted at the meeting of the Committee held in July 1948. The main conclusions drawn from the Statistical Analysis of the data for the two years are summarised below:—

1946-47 Experiments

(1) Time of sowing experiments—The vegetative period of the jute plant is found to depend very much on the time of sowing. Early sowings afford longer vegetative periods for the plants, while the vegetative period rapidly decreases with the lateness of sowing which also increases the mortality of the plants. It appears that sowings for Capsularis at the end of March and those for Olitorious in the middle of April allow full scope for development of the plants. It is also found that for early sowings

the plants reach the reproductive stage at a definite time of the year irrespective of the actual time of sowing. For late sowings the plants flower and bear fruit within a short period.

(2) Effect of standard solutions—The differential effect of four standards solutions, namely, Tottingham, Hogland, Shive R_3S_3 and Shive $R_5 S_2$, on the growth and development of the jute plant has been examined. Their relative merits as growth promoting factors have been tested statistically. Significant differences have been noted as regards the effect of the four solutions.

(3) Effect of Nitrogen supplied as Ammonium and as Nitrate—Nitrogen as Ammonium is on the whole found to be the better of the two in promoting growth.

(4) Effect of 3 levels of Nitrogen, Potassium, Phosphorous and Calcium—Nitrogen is the most important element promoting growth and a sufficient quantity of Nitrogen is required for the proper development of jute plants. Deficiency in Nitrogen results in stunted growth and delay in maturity.

(5) Experiments about micronutrients—In these experiments differences among the three treatments examined have been tested for statistical significance. For Capsularis, the differences generally do not appear to be significant, whereas for Olitorious some differences turn out to be significant.

1947-48 Experiments

(1) The influence of three levels of Nitrogen, Phosphorus, Potassium and Calcium—The data have been analysed by the method of analysis of variance and significant differences have been found in treatment effects. The differences between pairs of individual

treatments have also been tested statistically, the results of which have been used in grouping the treatments. Some border line cases have also been found, regarding which the results are ambiguous and further evidence is needed to arrive at definite conclusions.

(2) Experiments on NO_3 Vs. NH_4 at 2 leveles of K—The five treatments used in these experiments have been classified into different groups on the basis of the results of the statistical analysis. Here also some border line cases have been noted.

(3) Experiments with Vitamin B_1 and Yeast extract solutions—Significant differences in treatment effects on some growth indices have been noted for experiments with Capsularis. For Olitorius, however, the treatment effects are generally not significantly different from one another.

REVISION OF MARKETING REPORTS.

In accordance with the previous decisions of the Indian Central Jute Committee, revision of the Report on the Marketing of Jute and Jute Products (Second Report) was undertaken first and considerable progress made during the period. A large volume of data and information was collected from the available publications and from the trade and industry, and several sections of the Report were revised accordingly. The investigation regarding the position of the jute industry in foreign countries involved time; but thanks to the foreign Trade Commissioners and Consular Officers in India, much valuable information has been gathered through them. The Assistant Marketing Officer also personally contacted several persons in order to acquaint himself with the changes that had taken place in the trade and industry ever since the publication of the Report under revision.

With the exception of a few sections here and there on which it has not been possible so far to collect necessary information, the preliminary revision of the first four chapters

has been almost completed and the revision of Chapters V and VI is now under progress. As regards tables included in the Report, all of them except 2 or 3 have been revised and brought up to date so far as available statistics have permitted. They however require final checking.

SURVEY OF JUTE TRANSPORT.

Transport difficulties which were experienced in this part of the country after the cessation of the last World War continued to exist till the division of India in August 1947, thereby causing great hardship to the jute trade and industry. When the political division of India into Indian Union and Pakistan took effect, the transport position was found to deteriorate further. Frequent complaints were received by the Government of India from various *mofussil* centres urging them to look into the matter and see their way to improve the position. The Government of India therefore directed that the Indian Central Jute Committee should undertake an investigation and report to them on the matter. The Government of India also desired that a regular and careful watch should be kept on the situation in future and that they should be intimated whenever there was any transport bottleneck at any point so as to enable them to take necessary action in the matter. Accordingly, a fairly comprehensive survey was undertaken by the Committee's Assistant Marketing Officer in some of the important jute growing tracts of West Bengal, Assam, Bihar and Orissa wherefrom complaints of transport difficulty were received. The survey was supplemented by reports collected by the Supervisor of the Economic Research Section in course of his tour.

The following reports were prepared by the Assistant Marketing Officer and submitted to the Government of India :—

(1) Transport difficulty relating to the Jute Trade in Jalpaiguri, Darjeeling, West Dinajpur districts (West Bengal) and Cooch Bihar State and their wagon requirements during 1948-49 season;

(2) Transport difficulty relating to the Jute Trade in Malda (West Bengal) and Purnea (Bihar) and their wagon requirements during 1948-49 season;

(3) Transport difficulty relating to the Jute Trade in Assam and wagon and shipping space requirement for 1948-49 season; and

(4) Transport difficulty experienced by the Jute Trade in Orissa and wagon requirement during 1948-49 season.

The above reports contained valuable information regarding supply and distribution of jute and means of transport, besides containing details about the causes and nature of the problem as existed in the various jute growing provinces. The effect of the transport difficulties on the *mofussil* prices of raw jute and the extent to which growers in general suffered on account of low prices caused by short supply of freight space were also dealt with in these reports. They also contained many useful suggestions for removal of the transport difficulty together with an estimate of space requirement for 1948-49 season. Later, the transport position having further deteriorated in Jalpaiguri district (West Bengal) and Cuttack district (Orissa), during October 1948 and March 1949 respectively, the Government of India were intimated of the position after necessary investigation by the Supervisor of the Economic Research Section and all the five Senior Economic Investigators posted in the *mofussil*.

The transport enquiries revealed that the difficulties were not so much due to actual shortage of freight space as it was due to other factors which largely contributed to the same. Of these factors, seasonal and regional maldistribution of space were the most important of all which really created transport bottlenecks. It was also revealed that the tightness of wagon space in Indian railways was due to the fact that a large number of wagons belonging to the E. I., O. T. and Assam Railways were held up by the E. B. Railway (Pakistan).

A summary report on the transport position was considered by the Indian Central Jute Committee at its half-yearly meeting held in March 1949.

COLLECTION AND DISSEMINATION OF MARKET INTELLIGENCE.

The Indian Central Jute Committee at its meeting held in July, 1948 decided that the Calcutta loose jute price changes should be sent bi-weekly on Tuesdays and Fridays to centres selected by the respective provincial Governments. The necessity was also felt for acquainting the Senior Economic Investigators with the price changes so as to enable them to disseminate the information among the jute growers and to keep a watch on the movement of prices at the village end. A formal proposal for extending the service to the five Economic Investigation Centres was accordingly placed before the Local Sub-Committee of the Indian Central Jute Committee which directed that the matter should be referred to the provincial Governments concerned. The latter having approved of the proposal in due course, prices were also sent bi-weekly to the 5 Economic Investigators in addition to the centres already selected by the provincial Governments. The following table will give the particulars:

Province	No. of centres served		Total No. of Centres
	By Card	By Telegram	
1. West Bengal ...	22	...	22
2. Assam ...	12	1	13
3. Bihar ...	7	1	8
4. Orissa ...	6	1	7
5. United Provinces	1	1	2
Total ...	48	4	52

As there was some delay in arranging things in consultation with the Provincial Governments concerned, the price dissemination service commenced from the 28th September 1948, except in Orissa where the marketing season was late and therefore the service did not commence earlier than the latter part of October, 1948. So far as giving wide publicity to the information at the village end was concerned, it was the responsibility of the Provincial Governments and as such necessary arrangements were made by them.

The following routine items of work regarding market intelligence were also attended to as before:—

(1) Saturday quotations for raw jute were communicated by means of telegram to the Economic and Statistical Adviser to the Ministry of Agriculture, Government of India.

(2) Weekly Market Reviews were prepared and also forwarded to the same officer regularly.

(3) Monthly reviews of the Calcutta Raw Jute and Jute Goods markets were prepared and published in the Jute Bulletin.

(4) Balers' prices collected from certain selected *mofussil* centres were also published in the same.

(5) Prices of raw jute and jute goods were collected daily from the Calcutta markets and tabulated.

MISCELLANEOUS

(1) An investigation was carried out to find out the reasons for quoting abnormally low price for X Bottom by a *pucca* baler of Banderbil (Hooghly). It revealed that while the buyer did not buy jute on assortment basis nor did he assort it into *Kutcha* grades, quotations were supplied roughly on the basis of commercially recognised loose jute grades. Besides, X Bottom, which they were quoting for, consisted mostly of tangled, ravelled and weak jute which was not fit for inclusion in any export mark. This was said to be sold

to mills at low prices for their own consumption and as such, the *pucca* balers concerned could not afford to pay better prices than they were quoting, if they were to buy it as such. It was further learnt that the percentage of X Bottom was negligible;

(2) Information regarding the position of *Pucca* Jute Baling Industry in West Bengal and Eastern Pakistan was collected and furnished to the Government of India;

(3) A note on classification, grading and marketing of loose jute was prepared by the Assistant Marketing Officer and a lecture and demonstration on the same subject were given by him to the newly-recruited Jute Development Staff at the Committee's Jute Agricultural Research Institute, Chinsurah, in connection with their training. The Director of Jute Agricultural Research Institute was also assisted in the selection of centres in connection with the Jute Development Scheme;

(4) A brief note on the present position of the jute cottage industry in the Indian Union together with some proposals was submitted for the consideration of the All-India Cottage Industry Board set up by the Government of India;

(5) The question of fixing the parity price for U. P. jute was examined and a note on the subject was sent to the Joint Director of Agriculture, U. P.;

(6) Revision of the Section dealing with jute trade and industry as included in the Indian and Pakistan Year Book and Who's Who for publication in a new edition of the same;

(7) The Section dealing with the marketing of jute which was contributed some years back for publication in the Dictionary of Economic Products and Industrial Resources of India was revised;

(8) A note on the waste lands of Murshidabad and possibilities of growing jute on them was prepared and forwarded

to the Committee's Director of Jute Agricultural Research Institute;

(9) In connection with the Enquiry into Economic Consequences of Partition undertaken by the School of Economics, Bombay, answers to the questionnaire on quality, price and transport of jute, as well as capacity of Chittagong Port, number of *pucca* baling presses in East Bengal etc. were prepared and furnished to the appropriate quarter;

(10) In addition to some trade and Government enquiries, some enquiries regarding loose jute grades and specifications, as well as *mesta* were attended to.

PUBLICATIONS.

The following is a list of papers published from the Economic Research Section during the year under review:—

1. *Basak, K. C.*—The problem of raw jute (*Calcutta Geographical Review*, Vol. X, Nos. 1-4).
2. *Gupta, S. M.*—Transport of Jute (*Jute and Gunny Review*, February and March, 1949).
3. *Ganguli, S. M.*—The Problem of "Grow More Jute" in Assam (*Jute Bulletin*, March 1949).
4. *Basu, S.*—Jute and its trade in Jalpaiguri District (*Jute Bulletin*, November, 1948).
5. *Sarkar, D. C.*—Progress of Jute Substitutes (*Capital*, Diamond Jubilee Number, 1948).

ACKNOWLEDGMENTS.

The Director of Economic Research is grateful to the foreign Consuls and Trade Commissioners in India and to the Indian Jute Mills Association and other jute trade associations for ungrudgingly supplying useful information in connection with the revision of the Second Marketing Report whenever

approched for the same. We are also indebted to Messrs. J. C. Duffus & Co., J. Thomas & Co., (Jute & Gunnies) Ltd., H. D. Cartwright & Co., Landale & Clark Ltd., R. Sim & Co. and B. Adhikary & Co. for supplying market information as before. Thanks are also due to Government and other organisations from whom valuable co-operation has been received in connection with the work of the Section. The staff has rendered loyal support for which the Director would like to record his appreciation.

K. C. BASAK

10th June, 1949. *Director of Economic Research*



APPENDIX

Programme of work for 1948-49	Progress made	Future work
1. Investigation into the economics of jute growing.	The investigation was carried out in the five new centres selected in the jute growing provinces in the Indian Union. Cost of production of jute and paddy and farmer's economic condition in 1948-49 have been studied. Report of the investigation for 1948-49 has been prepared.	The investigation will continue in future. Attempts will be made to remove deffiiculties experienced last year.
2. Study of mofussil prices and other statistics.	This enquiry was carried out at the five centres selected for the investigation into the economics of jute growing. Data for primary and secondary markets for complete season have been collected and analysed. Report of the enquiry for 1948-49 is under preparation.	The Committee has sanctioned the continuance of the enquiry for another year.
3. Statistical analysis of data on physiology of jute.	The data for 1946-47 and 1947-48 have been analysed and the statistical report is under preparation.	Prof. Sen Gupta, who is in charge of the scheme on physiology of jute, has requested for a further analysis of his data and for a consolidated statistical report. This work may be taken up if approved by the Committee.

Programme of work for 1948-49	Progress made	Future work
4. Jute Substitutes.	A large volume of information on the growth of jute substitutes in the post-war period has been collected which has been utilized in revising the Section on jute substitutes in the Second Marketing Report. A study of the post war development of substitutes in Latin American countries is under progress. Several notes on substitutes were prepared.	This subject is under continuous study.
5. Revision of Marketing Reports.	Of the two Reports, the Report on the Marketing of Jute and Jute Products (Second Report) was taken up for revision. Considerable amount of data was collected from available publications and other sources and fairly good progress was made in the work. Preliminary revision of the first four chapters of the Report has been almost completed and revision of chapters V and VI is now under progress. As regards tables, all except 2 or 3 have been brought up to date so far as available statistics have permitted.	The revision of the remaining sections and chapters will be continued and it is hoped that the work will be complete by the end of September, 1949.
6. Collection and Dissemination of Market Intelligence.	Calcutta quotations for loose jute, pucca bales and jute goods were collected daily and	This work is to continue as at present.

	the same were tabulated. As per Committee's decision, loose jute prices were sent out bi-weekly by telegram or ordinary post to some selected centres in West Bengal, Bihar, Assam, Orissa and the U. P. In addition the information was supplied to the 5 centres selected for investigation into the economics of jute growing. Some routine items of work regarding market intelligence were also attended to as before.	
Other investigations not included in the programme of work.		
7. Planning for increased jute production.	Various aspects of the drive for increased jute production in India were investigated and a comprehensive note on the subject was prepared for the Planning Sub-Committee.	
8. Survey of Jute Transport.	This is an *ad hoc* enquiry undertaken on the direction of the Government of India. Investigations were made into the nature and causes of jute transport difficulty at a few selected centres in West Bengal, Assam, Bihar and Orissa and comprehensive reports were submitted to the Government of India and to the Indian Central Jute Committee. These reports also contained a study of the	As the Government of India desired that constant watch should be kept on the transport position relating to jute, this item of work will continue to engage attention of the Section.

Programme of work for 1948-49	Progress made	Future work
	effect of the transport difficulties on *mofussil* prices, remedial measures and estimated requirement for jute freight space during 1948-49 season.	
9. *Ad hoc* enquiries and miscellaneous work.	Enquiries were made regarding low quotations for X Bottom at Banderbil (Hooghly) and the position of *pucca* jute baling insustry in West Bengal and Pakistan. The results of the latter were furnished to the Government of India. Lecture and demonstration on classification, grading and marketing of loose jute were given by the Assistant Marketing Officer to the newly recruited Jute Development staff at the Committee's Jute Agricultural Research Institute. The Director of the Institute was also assisted in the selection of centres in connection with the Jute Development Scheme. Several notes were prepared and furnished to different quarters and many trade and Government enquiries on varied subjects were attended to.	Although this type of work does not seem to be a regular feature, similar enquiries etc. are forthcoming and are, therefore, likely to absorb much time in future.

APPENDIX IV

ANNUAL REPORT OF THE PUBLICITY SECTION FOR THE YEAR 1948-49.

The activities of the Publicity Section during the period 1948-49 were mainly confined to the following:—

1. Production and Distribution of the *Jute Bulletin*;
2. Press Propaganda;
3. Radio Publicity;
4. New Releases of the Indian Central Jute Committee's Publications;
5. Sale and Distribution of the Indian Central Jute Committee's Publications;
6. Operation of the Indian Central Jute Committee's Price Dissemination Service; and
7. Organisation of the Central Jute Museum.

1. Jute "Bulletin"

The *Jute Bulletin*, Committee's monthly journal, continued to be published and distributed regularly every month. Its ever-growing demand from all quarters of the globe is an index of its popularity as an authoritative journal disseminating all available information on jute and other fibres.

The *Jute Bulletin* served yet another useful purpose *e.g.* that of giving systematic publicity to the research activities of the Committee's various technical sections. Items of information in this regard are often bodily reproduced in sundry foreign journals.

A good Press, both Inland and Overseas, seems now to have been assured for the *Jute Bulletin*. It might as well be called an achievement for the *Bulletin* that the Press should make copious extracts from it in appreciation of its informative value.

Advertisements in the "Bulletin"

The value (gross) of space sold to advertisers during 1948-49 amounted Rs. 1962 as against Rs. 1,521 in 1947-48.

2. Press Propaganda

Remarkable was the progress made in Press Propaganda. (*See Appendix A*) Forty Press and Un-official Notes (as compared with 33 in 1947-48) were issued during the period and the response from the press, in so far as it published them *in toto* or in part, was really heartening. Some of the subjects dealt with were:

(*i*) *Bags from Linseed Straw—Argentine Experiment*;

(*ii*) *"Chukai" Fibre as a Jute Substitute*;

(*iii*) *World Consumption of Jute*;

(*iv*) *Possibilities of Growing Substitute Fibres in India*;

(*v*) *S. Africa Meets Bag Shortage*;

(*vi*) *"Saluyut"—A New Rival of Jute*;

(*vii*) *Use of Flax for Grain Bags*;

(*viii*) *Cuba to Reduce Sugar Bag Size*;

(*ix*) *Secondhand Bag Trade in U.S.A.*;

(*x*) *Drift away from Burlap Bags to Paper Containers*;

(*xi*) *Increased Jute Acreage—Planning Sub-Committee's Decisions*;

(*xii*) *German Jute Industry*.

3. Radio Publicity

As listeners may have noted, extracts from all important Press Communiques issued by this section were broadcast by the Calcutta Centre, All-India Radio.

4. New Releases

Four new publications of the Indian Central Jute Committee were released during the period under review. They were:

(*1*) *Economic Research Memoir No. 1—Dealing with World Consumption of Jute*;

(*2*) *Acid Nature of Jute Fibre*;

(*3*) *Hemi-celluloses of Jute Fibre*;

(*4*) *Possibilities of Increased Production of jute in the Indian Union*.

As a result of successful Press publicity given by this section to the *Economic Research Memoir No. 1* and *Possibilities of Increased Production of Jute in the Indian Union*, the reading public have consumed about 75 per cent of the total printed copies of these publications.

5. Sale and Distribution of Publications

Copies of the Committee's various publications, other than the *Bulletin*, sold and distributed free during the period under review totalled 218 and 954 respectively as compared to 660 and 688 in 1947-48. It may be noted here that the actual demand is much greater than these figures would indicate. But as most of these publications happen to be out of stock, it was not possible to meet the greater demand.

6. Price Dissemination Service

The Price Dissemination Service of the Indian Central Jute Committee was continued to be operated by the Publicity Section as usual. Price cards and telegrams containing the Calcutta Loose Jute market quotations were sent regularly to 52 centres, distributed as follows:—

By Post Cards			By Telegrams		
West Bengal	...	22	Bihar	...	1
Assam	...	12	U.P.	...	1
Bihar	...	7	Assam	...	1
Orissa	...	6	Orissa	...	1
U.P.	...	1			

7. Jute Museum

A number of new pictorial charts have been added to the Museum's collections. "World-Wide Demand for India's Jute Goods," "Distribution of Jute Acreage in India and Pakistan," and "Production of Raw Jute in India and Pakistan" are among them. As a measure to facilitate Indian Central Jute Committee's participation in exhibitions outside, duplicates of all the existing charts in the Museum were prepared. Moreover, all the exhibits which were soiled have been replaced. Quotations were invited for the preparation of all possible

models and cloth-lining and framing of the charts were completed.

The Publicity Section secured for display in the Museum 38 new samples of jute speciality products from Mr. K. D. Jalan. They are: 7 pieces of Fancy Chair Carpets, 5 pieces of Fancy Twills, 6 pieces of D. B. Floor Runner, 2 pieces of Diamond Weave, 14 kinds of Fancy Webbings, 2 kinds of Plain Webbings, 2 kinds of Stripe Jute Webbings. Mr. Jalan has also kindly supplied us with a glass show-case for displaying the speciality goods. Besides these, this Section was also able to secure 10 carpets of different sizes, 2 Jute Sample Books, and a bundle containing 41 pieces of different sample cuttings from Messrs. Birla Brothers.

The Committee will be glad to know of our successful participation in the South-East Asia Economic Resources Exhibition held in Calcutta from September 25 to October 3, 1948, which was inaugurated by His Excellency Dr. K. N. Katju, Governor of West Bengal. The Consensus of opinion was that our stall was the best and the most instructive portion of the exhibition.

At the request of the Government of India, Ministry of Agriculture, the Indian Central Jute Committee also took part in the exhibition in connection with the campaign for adult education in the city of Delhi.

M. C. MUKHERJI,
For Publicity Officer.

APPENDIX A

Partial analysis of Publicity obtained for the Press and Un-official Notes issued by the Publicity Section during 1948-49.

Names of Periodicals and News papers.	1947-48 Column ins.	1948-49 Column ins.
1. Cordage World	72	40
2. Jute & Canvas Review	93	105
3. Fibres	34	36
4. Cordage Magazine	98	80
5. Capital	86	90
6. Commerce	90	130
7. Journal of Scientific & Industrial Research	24	40
8. Commerce & Industry	45	42
9. Science & Culture	—	10
10. Statesman	28	37
11. Amrita Bazar Patrika	44	40
12. Hindustan Standard	88	103
13. Ananda Bazar Patrika	47	50
14. Jugantar	34	36
15. Star of India	99	96
16. Times of Assam	—	17
Total	882	952

The above is only a partial analysis of the publicity obtained for the Indian Central Jute Committee, covering only 16 journals to which we have access. The Publicity Material is actually issued to 127 journals recommended by the Central Government. For lack of proper staff and access to all of the 127 journals, it is not possible to maintain a detailed and complete analysis. References by parties now and then bear evidence to the fact that our Press-Notes are published in other important journals also, besides those listed above.

APPENDIX B

A tabular statement indicating the Sanctioned Programme of work of the Publicity Section and the progress made under each item.

Programme Sanctioned	Progress made	Remarks
(*i*) Production and Distribution of the Monthly *Bulletin;*	Produced and Distributed regularly every month.	
(*ii*) Press campaign by means of Press-Notes and articles illustrated with pictures in the press;	40 Press Notes issued and published.	
(*iii*) Arrangements for broadcasting Radio talks;	Extracts from important press-notes were broadcast through the courtesy of the All-India Radio authorities.	
(*iv*) Preparation and distribution of posters, as necessities arise;		No occasion arose during the period.
(*v*) Preparation and distribution of propaganda leaflets and pamphlets;	"Grow More Jute" leaflets were distributed.	
(*vi*) Loose Jute Price Dissemination scheme;	Calcutta Loose Jute Market quotations were sent to 52 centres of West Bengal, Bihar, Orissa, Assam and the U. P.	
(*vii*) Organisation of a Central Jute Museum;	A good collection of exhibits has been made.	
(*viii*) Sale and Distribution of all publications of the Indian Central Jute Committee other than the *Bulletin*.	Satisfactory progress has been maintained. 218 copies were sold and 954 distributed free.	Several important publications having run out of stock demands could not be met in full.

Publicity

During 1948-49, Mr. K. I. A. Quaderi was in charge of the Publicity Section. The work of the section was carried on according to the programme laid down by the Committee. The progress of work on the main items is summarised below :—

1. *Jute Bulletin*: The Committee's monthly journal, the *Jute Bulletin*, continued to be published and distributed regularly every month and maintain its popularity as an authoritative publication on jute and other fibres among an ever-widening circle of readers.

2. *Press Propaganda*: Forty Press and Un-official Notes, which were issued by this section during the year, received due publicity in India and abroad.

3. *Radio Publicity*: The Calcutta Station of the All-India Radio extended its valued co-operation by broadcasting extracts from important Press Notes issued by the Section.

4. *New Releases*: Four new publications of the Indian Central Jute Committee were issued during the period under review.

5. *Sale and Distribution of Publications*: Excluding the *Bulletin*, this section sold 218 copies of the various publications of the Committee and distributed 954 copies of the same free.

6. *Price Dissemination Service*: During the year, post cards and telegrams containing prices of loose jute in Calcutta were sent to 52 centres in West Bengal, Bihar, Assam, Orissa and the U.P.

7. *Jute Museum*: A number of new pictorial charts and duplicates of all existing charts were prepared and the soiled ones replaced. Thirty-eight new samples of jute speciality products were received from Mr. K. D. Jalan, while Messrs. BIRLA BROS. supplied the Museum with an interesting variety of jute manufactures. The Committee successfully participated in the South-East Asia Economic Resources Exhibition held in Calcutta from September 25 to October 3, 1948. At the India Governments's request the Committee also took part in the Delhi exhibition in connection with the compaign for adult education.



APPENDIX V

List of Members of the Indian Central Jute Committee on the 1st April, 1949.

1.	*Ex-officio* President	Sardar Datar Singh, Vice-Chairman, Indian Council of Agricultural Research and Additional Secretary to the Govt. of India, Ministry of Agriculture, New Delhi.
2.		The Agricultural Commissioner with the Govt. of India, Ministry of Agriculture, New Delhi.
3.	Four persons nominated by the Govt. of India.	1. Shri Basanta Kumar Das, M.C.A. Contai, Midnapore. 2. Mr. Lakshimpat Singhania, Kamala Tower, Cawnpore. 3. Prof. M. N. Saha, F.R.S. University College of Science, 92, Upper Circular Road, Calcutta. 4. Mr. K. K. Chettur, M.A., Jt. Secretary to the Govt. of India, Ministry of Commerce, New Delhi.
4.	A representative of the Agriculture Department of the Govt. of West Bengal nominated by that Govt.	The Director of Agriculture, Animal Husbandry and Fisheries, West Bengal, Writers' Building, Calcutta.
5.	A representative of the Agricultural Department of the Govt. of Bihar, nominated by that Govt.	The Director of Agriculture. Bihar, Patna.

6. A representative of the Co-operative movement in West Bengal nominated by the Govt. of West Bengal.	The Registrar of Co-operative Societies, West Bengal, 8, Lyons Range, Calcutta.
7. Two members elected by the Indian Jute Mills Association.	1. Mr. I. G. Kennedy, C. B. E. C/o. Messrs. Jardine Henderson Ltd., 4, Clive Row, Calcutta. 2. Mr. D. I. Duff, C/o. Messrs. Barry & Co., 2, Fairlie Place, Calcutta.
8. One member elected by the Bengal Chamber of Commerce.	Mr. J. N. Smart, C/o. Messrs. Landale & Clark Ltd., 11, Netaji Subhas Road, Calcutta.
9. One member elected by the Bengal National Chamber of Commerce.	Mr. J. N. Sengupta, C/o. Messrs. Hindusthan Development Corpn. Ltd., 4, Chittaranjan Avenue, Calcutta.
10. Two members elected by the Indian Chamber of Commerce.	1. Mr. K. D. Jalan, C/o Messrs Suraj Mull Nagar Mull, 8, Dalhousie Sq. East, Calcutta. 2. Mr. Bhagirat Kanoria, C/o. Messrs. The General Produce Co., Ltd., 8, Royal Exchange Place, Calcutta.
11. One representative of the Shipping and Baled Jute interests nominated by the Calcutta Baled Jute Association.	Mr. G. Euthymopulo, C/o. Messrs. Rally Brothers, 16, Hare Street, Calcutta.

12.	One representative of the Jute Trade nominated by the Govt. of Bihar.	Mr. Mohan Lal Jeloka, Katihar, District—Purnea.
13.	One representative nominated by the Govt. of Assam.	Srijut Gopal Chandra Bora, B. sc., B. L., Secretary, Bar Library, Nowgong, Assam.
14.	Three representatives of Agricultural interests of West Bengal nominated by the Govt. of West Bengal.	1. Sree Haripada Chatterjee, Krishnagar, Nadia. 2. Sri Kishori Mohan Das, President. Basirhat Sub-Divisional Congress Committee, Basirhat, 24-Parganas. 3. Sree Sudhangshu Sekhar Singha Roy, M. A., B.L., Kaikala, District-Hoogly.
15.	Two jute growers to be nominated by the Govt. of Assam.	1. The Director of Agriculture, Assam, Shillong. 2. Mr. Purandar Sharma. M.L.A., Mangaldai, District-Darrang Assam.
16.	Two jute growers to be nominated by the Govt. of Bihar.	1. Rai Bahadur Raghubans Prasad Singh, Kursela, P.O. Ayodhyaganj Bazar, Sadar Sub-Division, District-Purnea. 2. Mr. Baidyanath Chowdhury, President, District Congress Committee, Purnea.
17.	One member nominated by the Govt. of Orissa to represent interests of Orissa.	The Director of Agriculture, Orissa, Cuttack.
18.	One member to be nominated by the Govt. of United Provinces to represent the interests of U. P.	Mr. John A. Manwwar, M.A. B.Sc. (Edin.) Joint Director of Agriculture, United Provinces, Lucknow.

APPENDIX VI

List of members of the Standing Sub-Committees of the Indian Central Jute Committee.

Local Sub-Committee

1. President
2. Mr. I. G. Kennedy, C.B.E. *Chairman.*
3. Shri Basanta Kumar Das, M.C.A.
4. Mr. D. I. Duff
5. Mr. J. N. Smart
6. Mr. K. D. Jalan
7. Prof. M. N. Saha, F.R.S.
8. Mr. Haripada Chatterjee, M.L.A.
9. Mr. Kishori Mohan Das
10. Sri Sudhangsu Sekhar Singha Roy, M.A., B.L.

Agricultural Research Sub-Committee

1. President
2. Agricultural Commissioner with the Govt. of India
3. Mr. Lakshmipat Singhania
4. Director of Agriculture, West Bengal
5. Director of Agriculture, Assam
6. Mr. Purandar Sarma
7. Rai Bahadur Raghubans Prasad Singh
8. Mr. Baidyanath Chowdhury
9. Director of Agriculture, Bihar
10. Director of Agriculture, Orissa
11. Mr. John A. Manwwar
12. Mr. G. C. Bora, B.Sc., B.L.
13. Mr. Sudhanshu Sekhar Singha Roy

Co-opted Members

14. Prof. S. P. Agharkar, M.A., Ph.D., F.N.I.
15. Prof. S. N. Bose, M.Sc., F.N.I.
16. Dr. J. N. Mukherjee, D.Sc., C.B.E.

Technological Research Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E.
3. Agricultural Commissioner with the Govt. of India.
4. Mr. Lakshmipat Singhania.
5. Prof. M. N. Saha, F.R.S.
6. Mr. D. I. Duff.
7. Mr. J. N. Sen Gupta.
8. Mr. K. D. Jalan.
9. Mr. Bhagirath Kanoria.
10. Mr. Mohan Lal Jeloka.
11. Rai Bahadur Raghubans Prosad Singh.
12. Director of Agriculture, Orissa.
13. Mr. John. A. Manwwar.

Co-opted Members.

14. Mr. S. E. Kumana.
15. Dr. W. G. Macmillan, Ph. D.
16. Prof. B. C. Guha, D. Sc.
17. Prof. J. K. Chowdhury, D. Sc., F. N. I.
18. Dr. S. Krishna.

सत्यमेव जयते

Economic Research & Publicity Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E.
3. Mr. Lakshmipat Singhania.
4. Mr. K. K. Chattur, M. A.
5. Director of Agriculture, West Bengal.
6. Director of Agriculture, Bihar.
7. Mr. D. I. Duff.
8. Mr. J. N. Smart.
9. Mr. K. D. Jalan.

10. Mr. Haripada Chatterjee.
11. Director of Agriculture, Assam.
12. Mr. Purandar Sarma.
13. Director of Agriculture, Orissa.

Co-opted Members.

14. Prof. P. C. Mahalanobis, F. R. S.
15. Prof. J. C. Sinha, Ph. D.
16. Mr. D. K. Sanyal, M.A., O.B.E.
17. The Registrar of Co-operative Societies, Orissa.

Agricultural Research Appointments Sub-Committee.

1. President.
2. Dr. J. N. Mukherjee, D. Sc., C.B.E.
3. Prof. S. P. Agharkar, M.Sc., Ph.D., F.N.I.
4. Prof. S. N. Bose, M.Sc., F.N.I.
5. Mr. Baidyanath Chowdhury.

Technological Research Appointments Sub-Committee.

1. President.
2. Sree Basanta Kumar Das, M.C.A.
3. Prof. M. N. Saha, F.R.S.
4. Mr. K. D. Jalan.
5. Mr. J. N. Sen Gupta.

Economic Research and Publicity Appointments Sub-Committee.

1. President.
2. Mr. I. G. Kennedy.
3. Sri Basanta Kumar Das, M.C.A.
4. Sri Kishori Mohan Das.
5. Dr. J. C. Sinha.

Marketing Appointments Sub-Committee.

1. President.
2. Sri Basanta Kumar Das, M.C.A.
3. Agricultural Marketing Adviser to the Govt. of India.
4. Mr. J. N. Smart.
5. Mr. Mohan Lal Jeloka.
6. Mr. Sudhangshu Sekhar Singha Roy.

सत्यमेव जयते

APPENDIX VII

List of Scientific and other Officers of the Indian Central Jute Committee as on the 1st April, 1949.

Administration.

1.	Secretary	...	Dr. J. V. Lakhani, M.Sc., Ph.D., A.I.I.Sc.
2.	Superintendent	...	Mr. R. C. Biswas, B.Sc. (Hons.)
3.	Head Assistant	...	Mr. S. K. Acharyya B.Sc., B.Com., B.L.
4.	Accountant	...	Mr. S. C. Das, M.A. (Com.)

Marketing Section.

5.	Marketing Officer	...	Vacant
6.	Assistant Marketing Officer	...	Mr. S. M. Gupta, B.Ag.

Economic Research Section.

7.	Director	...	Mr. K. C. Basak, B.A., (Cantab)
8.	Statistical Officer	...	Vacant
9.	Supervisor	...	Mr. S. M. Ganguli, M.A. B.L.
10-12.	Statistical Assistants	...	Mr. D. C. Biswas, M.A. Mr. T. B. Banerjee, M.A. Mr. A. K. Bhattacharyya, M.A.
13.	Librarian ...	...	D. C. Ray, M.A. (Double)

Publicity Section.

14.	Publicity Officer	...	Mr. K. I. A. Quaderi
15.	Publicity Assistant	...	Mr. M. C. Mukherjee, M.A.

Agricultural Research Laboratories.

16.	Director ...	...	Dr. B. C. Kundu, M.A., Ph.D., F.L.S., F.N.I.
17.	Botanist ...	...	Mr. B. Das Gupta, M.Sc.
18.	Agronomist ...	...	Vacant

19.	Assistant Botanist ...	Mr. S. J. Ghosh, B.Sc., (Offg.)
20.	Assistant Chemist ...	Vacant
21.	Assistant Entomologist ...	Mr. N. Dutta, M.Sc.
22.	Assistant Mycologist ...	Mr. T. Ghose, M.Sc.
23-24.	Scientific Assistants ...	Mr. S. Sarma, M.Sc. Mr. N. S. Rao, M.Sc. (Agri).
25.	Cytological Assistant ...	Mr. R. M. Dutt, M.Sc.
26.	Mycological Assistant ...	Mr. K. V. George, M.Sc. (Ag.)
27.	Soil Micro-biological Asst.	Mr. R. K Bose, M.Sc.
28-29.	Assts. to Agronomist ...	Mr. B. K. Das, B.Sc. (Agri). Mr. D. B. Khan, B.Sc. (Ag.)
30.	Entomological Assistant ...	Mr. P. K. Mukherjee, M.Sc.
31.	Head Clerk and Accountant	Mr. R. C. Chakraborty, B. A.

Technological Research Laboratories

32.	Director	Mr. C. R. Nodder, M.A. (Cantab)
33.	Manager, Experiemental Spinning Mills ...	Mr. A. S. Gillies
34.	Senior Research Physicist	Dr. K. R. Sen, D.Sc. (Dacca)
35.	Senior Research Chemist	Dr. P. B. Sarkar, D.Sc. (Dacca)
36.	Junior Research Assist. (Physicist) ...	Mr. B. K. Chakrabarty, M.Sc.
37.	Junior Research Assist (Chemist) ...	Dr. H. Chatterjee, M.Sc. Phil. F.R I.C.
38.	Head Tester ...	Mr. S. B. Bandopadhyay, M. Sc.
39.	Librarian	Mr. P. R. Mukherjee B.Sc. (Hons).
40.	Head Clerk	Mr. T. C. Chakravarty.

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS.	Rs.	As.	P.	Rs.	As.	P.
OPENING BALANCE—						
Cash in Hand ...	262	11	9			
With Imperial Bank of India in Current Account ...	4,25,148	15	1			
Cash at Sub-offices ...	580	0	0			
Investment in 3% Government Loan, 1963-65	24,671	0	0			
				4,50,662	10	10
(A) MONEY RECEIVED UNDER RESOLUTION—						
No. F. 254/34/A of the Govt. of India, late Deptt. of Education, Health & Lands, dated Simla, the 28th May, 1936 ...	...			10,00,000	0	0
(B) OTHER MONEYS RECEIVED BY THE SOCIETY—						
(i) Proceeds realised by sale of I.C.J.C. publications ...	756	9	6			
(ii) Proceeds realised by sale of advertisement space in the Committee's Bulletin ...	903	2	0			
(iii) Refund of Contributions to the Employees' Provident Fund	301	11	0			
(iv) Miscellaneous ...	792	13	0			
(v) Realisation of advance given to Provincial Governments in 1947-48 for purchase of jute seeds (*vide* statement of Receipts and Payments for the year ended 31-3-48) ...	14,882	5	6			
				17,636	9	0
Carried over ...	...			14,68,299	3	10

VIII.

JUTE COMMITTEE.

for the year ended 31st March, 1949.

EXPENDITURE.	Rs.	As.	P.	Rs.	As.	P.
ADMINISTRATION OF THE SOCIETY :						
Pay of Officers	11,999	15	0			
Pay of Establishment ...	19,876	2	0			
Allowances	19,602	11	0			
Medical Aid to the Servants of the Committee	8,343	14	9			
Contingencies	21,602	11	0			
Grants-in-aid, Contributions, etc.	1,821	7	0			
MEASURES TAKEN IN CONNECTION WITH THE WORK ON THE IMPROVEMENT OF THE AGRICULTURE OF JUTE.				83,246	12	9
RECURRING						
Pay of Officers	17,106	11	0			
Pay of Establishment ...	37,457	11	0			
Allowances	39,119	5	0			
Supplies and Services ...	341	14	6			
Contingencies	29,060	15	6			
Grants-in-aid, Contributions etc.	4,299	1	0			
University Schemes ...	17,235	1	0			
	1,44,620	11	0			
NON-RECURRING						
Expenditure in connection with the setting up of Jute Agricultural Research Institute ...	59,859	9	9			
				2,04,480	4	9
Carried over ...	...			2,87,727	1	6

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward ...	...	14,68,299 3 10
(C) INTEREST ON INVESTMENTS	...	748 0 0
(D) SUBSCRIPTION RECEIVED FOR PAYMENT TO GANDHI NATIONAL MEMORIAL FUND (AMOUNT TO BE PAID TO GANDHI NATIONAL MEMORIAL FUND) ...	...	33 8 0
Carried over ...	...	14,69,080 11 10

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VIII.

JUTE COMMITTEE.

for the year ended 31st March, 1949 (contd.)

EXPENDITURE—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward ...	...	2,87,727 1 6
MEASURES TAKEN IN CONNECTION WITH THE IMPROVEMENT IN THE TECHNOLOGY OF JUTE—		
RECURRING		
Pay of Officers ...	54,619 3 0	
Pay of Establishment ...	46,579 10 0	
Allowances ...	50,482 11 0	
Supplies & Services ...	12,657 9 0	
Contingencies ...	9,896 11 0	
Grants-in-aid and Contributions	7,902 10 0	
University Schemes ...	28,782 11 9	
Passage Allowance ...	12,953 11 0	
NON-RECURRING		
Water Tank etc. ...	2,447 1 9	
		2,26,321 14 6
MISCELLANEOUS		
I. ECONOMIC RESEARCH AND MARKETING SECTION—		
Pay of Officers	13,193 15 0	
Pay of Establishment ...	24,418 2 0	
Allowances	22,851 7 0	
Grants-in-aid, contributions, etc.	4,059 10 0	
Scheme for Economics of Jute Growing and Dr. J.C. Sen Gupta's Scheme	29,603 1 9	
Contingencies	8,053 6 3	
		1,02,179 10 0
II. PUBLICITY SECTION.		
Pay of Officers	6,639 5 0	
Pay of Establishment ...	4,849 0 0	
Allowances	8,002 14 0	
Contingencies	4,947 13 6	
Grants-in-aid, Contributions, etc.	837 12 0	
Museum	1,867 3 3	
		27,143 15 9
Carried over ...	...	6,43,372 9 9

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payment

RECEIPTS—*Contd.*		Rs. As. P.	Rs. As. P.
Brought forward	...	...	14,69,080 11 10
Carried over	...	...	14,69,080 11 10

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VII.

JUTE COMMITTEE.

for the year ended 31st March, 1949 (contd.)

EXPENDITURE—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward ...	...	6,43,372 9 9
III. JUTE DEVELOPMENT SCHEME	...	86,810 11 0
IV. SCHEME FOR THE EMPLOYMENT OF SPECIAL AGRICULTURAL STAFF IN JUTE GROWING AREAS—		
West Bengal (Scheme of Intensive production of Jute)	8,438 11 0	
Bihar	23,600 0 0	
Assam	10,600 0 0	
Orissa	563 0 0	
		43,201 11 0
EXTRA EXPENDITURE FOR IMPLEMENTATION OF THE CENTRAL PAY COMMISSION'S RECOMMENDATIONS WITH REGARD TO THE REVISION OF PAY SCALES OF STAFF WITH EFFECT FROM THE 1-1-47.		
Administration	12,816 12 0	
Agricultural Research Institute	21,824 13 0	
Technological Research Laboratories	37,043 0 0	
Economic Research & Marketing Sections	27,684 11 0	
Publicity Section ...	3,665 5 0	
Special Agricultural Staff ...	4,234 10 0	
		1,07,233 3 0
MONEY REFUNDED TO PROVIDENT FUND ACCOUNT VIDE STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31-3-48	...	3 11 0
Carried over ...	...	8,80,621 13 9

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward	...	14,69,080 11 10
TOTAL Rs. ...	...	14,69,080 11 10

AUDITORS' REPORT:

We beg to report that we have audited the Statement of Receipts and Expenditure of the Indian Central Jute Committee for the year ended 31st March, 1949, and above set forth, with the accounts and vouchers, and have obtained all the information and explanations we have required. In our opinion, subject to our separate report, such statement correctly sets forth the transactions of the Committee for the year.

CALCUTTA,
6, Hastings Street,
The 11th July, 1949.

G. BASU & CO.,
Chartered Accountants,
Auditors.

VIII.

JUTE COMMITTEE.

for the year ended 31st March, 1949 (contd.)

EXPENDITURE—*Contd.*	Rs. As. P.	Rs. As. P.
Brought forward ...	...	8,80,621 13 9
MONEYS PAID TO I.C.J.C. PROVIDENT FUND ACCOUNT AMOUNT TO BE REALISED FROM P. F. ACCOUNT AND RE-IMBURSED TO COMMITTEE	...	847 0 0
BALANCE ON 31st MARCH, 1949		
In Hand	20 15 6	
With Imperial Bank of India on Current Account ...	5,62,339 8 7	
At Sub-Offices ...	580 0 0	
Investment in 3% Government Loan 1963/65 (Face Value Rs. 25,000/-)	24,671 0 0	5,87,611 8 1
TOTAL Rs. ...	...	14,69,080 11 10

G. C. SEN,

Secretary,

Indian Central Jute Committee.


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APPENDIX X

Abstract Revised budget estimates of the Indian Central Jute Committee for the year 1948-49 and budget estimates for the year 1949-50.

	Schemes.	Revised estimates for 1948-49.	Budget estimates for 1949-50.
		Rs.	Rs.
1.	Administration	92,700	84,600
2.	An Enquiry into the Marketing and Transport of Jute and its products	13,300	15,800
3.	A Scheme of Agricultural Research on Jute	2,55,100	2,01,200
4.	A Scheme for setting up of an Institute for research on the Technology of Jute		
	(I) Technological Research Laboratories	2,31,000	2,40,500
	(II) Proposed New Scheme for extension of the work of the Technological Research Laboratories ...	26,700	14,500
5.	A Scheme for the collection and distribution of Statistics and Information on Jute		
	(*a*) Economic Research Section.	91,900	1,01,500
	(*b*) Publicity Section ...	38,100	50,200
6.	A Scheme for the Employment of Special Agricultural Staff in the Jute areas	45,400	...
7.	A Scheme for production and distribution of jute seeds of the improved varieties ...	40,000	...
8.	Funds required for the implementations of the Pay-Commission's recommendations ...	1,07,000	48,000
9.	Jute Developmental Scheme and seed multiplication farms ...	1,88,900	4,53,000
	Total ...	11,30,100	12,09,300
	Add closing balance ...	20,000	20,000
		11,50,100	12,29,300


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CALCUTTA.





ANNUAL REPORT

OF THE

INDIAN CENTRAL JUTE COMMITTEE

FOR THE YEAR
1949-50.

Calcutta

1951

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ANNUAL REPORT OF THE INDIAN CENTRAL JUTE COMMITTEE FOR THE YEAR 1949-50.

CONSTITUTION AND PERSONNEL.

It must be repeated as a historical fact that the Indian Central Jute Committee was originally set up by the Government of India, by Resolution No. F 254/34/A dated the 28th May, 1936, in the then Department of Education, Health and Lands, with the object to deal primarily with researches on all aspects of jute from the field to the factory.

Consequent on the partition of India into two dominions, the Indian Central Jute Committee started functioning in the Indian Union with modified constitution from December, 1947, under the orders of the Government of India, Ministry of Agriculture. All the organisations such as Jute Agricultural Research Institute and Economic Investigation Department, which were located in Eastern Pakistan before Partition were set up afresh in Calcutta and the Indian Union from the beginning of the year 1948.

The Committee's activities are mainly financed by the Government of India. In 1948 and in the subsequent years Rs. 10 lakhs have been received each year as annual grants.

A list of members of the Committee as on 1st April, 1950 showing the constituencies they represent is given in the Appendix V. During the year under report following changes took place in the personnel of the Committee.

Messrs. D. I. Duff and J. N. Smart resigned and were replaced by Messrs. F. H. Kidd and T. B. Elley. The term of membership of Prof. M. N. Saha, F.R.S. expired and the Government of India nominated in his place Dr. K. Venkataraman, Director, Department of Chemical Technology, University of Bombay, Matunga, Bombay.

Sardar Datar Singh, Vice-Chairman, Indian Council of Agricultural Research and Additional Secretary to the Government of India, Ministry of Agriculture and Mr. I. G. Kennedy, C.B.E., continued to act respectively as the President and the Vice-President of the Committee.

During the year under report, Mr. C. R. Nodder, the Director of the Technological Research Laboratories, retired after 12 years of service. It may be mentioned that during his tenure as the Director, the Institute made a remarkable progress and published several important conclusions and researches on the technology of Jute. Several of his conclusions have been adopted by the mills yielding to greater efficiency and economy in the manufacture of jute goods.

The vacancy caused by his retirement has been temporarily filled by Dr. P. B. Sarkar who was working under him, as the Senior Research Chemist. During the short time that Dr. Sarkar has been in charge, he has maintained the high traditions and reputation of the Technological Research Laboratory.

Further, during the year under report the Publicity Officer Mr. K. I. A. Quaderi whose good record of service under the Committee extended over a period of 10 years, died as a victim of Tuberculosis and his duties have been carried out by the Publicity Assistant, Mr. M. C. Mukherjee, as efficiently as any well-trained man could have done.

Five new additions were made to the Staff. Mr. S. S. Paul was appointed as Manager of the Experimental Spinning Plant in the Technological Research Laboratories. Drs. B. K. Kar and M. K. Mukherjee were appointed respectively to the posts of Physiologist and Assistant Chemist and Messrs. A. T. Sanyal and A. K. Paul to the posts of Agronomist and Assistant Botanist all in the Jute Agricultural Research Institute.

During the year under report the total normal expenditure on the various Sections, including the salaries of the staff and the maintenance of the laboratories was Rs 7,88,378-14-1, and on

Jute Development Scheme for increased production of Jute in the Indian Union Rs. 2,11,105-1-9 out of Rs. 4,95,403 set apart for the purpose.

The work of the Jute Development scheme may be broadly outlined as follows:—

1. *Propaganda*

(a) Holding and addressing growers' meetings,

(b) teaching the growers improved methods of cultivation and retting,

(c) distribution of hand-bills, leaflets and booklets,

(d) informing the growers price of raw jute in Calcutta markets,

(e) exhorting cultivators to use fertilizers and manures in jute crop,

(f) demonstrations in the use of wheel-hoes and sowing jute in lines,

(g) explaining ways and means including double cropping and cultivation of waste lands, for increasing jute cultivation.

2. Conduction of subvention trials.

3. Collection of market data.

4. Survey of jute transport position.

5. Making registered growers for multiplication of seeds.

6. Plant protection work.

7. Survey of jute areas.

Eleven meetings of the Local Sub-Committee were called and some important resolutions passed are given below :—

(1) In estimating the actual acreage under jute, the Government of West Bengal should be requested to apply the technique evolved by Prof. P. C. Mohalanobis under the auspices of the Indian Central Jute Committee as this was the most accurate method of determining the area under cultivation.

(2) For the increased production of jute, the cultivators should be assured of lower prices for his foodstuff *viz.* paddy and rice.

(3) That experimental work on linseed fibre should be taken up without delay.

(4) For Jute Seed Multiplication Farms the Committee decided that they be established by business firms etc., and in this connection Indian Tea Association and similar other organisations should be contacted.

(5) That the Sub-Committee should have several "wheel-hoes" for demonstration purposes at its different centres, and if necessary, should buy and distribute them to the cultivators at cost price. It should be made known to the cultivators as to where these "wheel-hoes" are available.

In the last annual report it had been stated that the acute shortage of Jute was the most important problem to be tackled. This Committee and the Government of India have been concentrating their full energy and resources to increase the cultivation of jute in all the Jute Growing States with a view to make Indian Union self-sufficient in this commodity by 1952. It is therefore to be mentioned with some satisfaction and pride that during the year under report additional 4 lakhs of acres were put under Jute. The total production of raw Jute has been accepted to be nearly 31 lakhs bales as against 21 lakhs in

1948-49. Following statement gives the acreage production of Jute Statewise for the year under report :—

State		Area (acres)	Production (bales)
West Bengal Districts	...	4,57,500	13,45,300
Cooch Behar	...	40,473	1,07,227
Tripura	...	13,000	26,000
Assam	...	2,58,700	7,17,400
Bihar	...	3,34,759	7,69,946
Orissa Old districts	...	47,577	1,40,969
Merged territories	...	6,309	9,857
		11,58,318	31,16,699

This satisfactory progress in the increased production of Jute is being maintained and it is expected that in the coming year the production will be about 40 lakhs bales in the Indian Union besides Mesta which will be about 8 lakhs bales.

It may be added that this achievement in the increased cultivation and production of Jute is also mainly due to the driving force of the President Sardar Datar Singh and the keen personal interest he has been taking.

In the last Annual Report it had been mentioned that the President had personally requested the West Bengal Government for the grant of a plot of land measuring about 150 acres in the vicinity of Calcutta for the development of a permanent Jute Agricultural Research Institute. The Government of West Bengal in their letter No. 1574 dated 8th March, 1950 offered a piece of land near Barrackpore which was approved by the Committee and also the Director, Jute Agricultural Research Institute, and the West Bengal Government was requested to

make arrangements for the transfer of this land to the Indian Central Jute Committee as early as possible. In the hope of getting the possession of the land at a very early date, the Committee set apart in its budget a sum of nearly Rs. 2,50,000/- for the buildings and the development of this new land.

The latest position is that the Government of West Bengal is completing its formalities for acquiring the land and transferring the same to the Committee. As soon as the possession is secured, plans will be got ready and the Government of India approached to provide more funds to the Committee for its development.

ACKNOWLEDGMENT

Secretary is personally grateful to the President, Sardar Datar Singh, Vice-Chairman, Indian Council of Agricultural Research and Additional Secretary to the Government of India, Ministry of Agriculture and to the Vice-President, Mr. I. G. Kennedy, C. B. E. for the valuable advice and guidance received from them during the year under report.

I must also acknowledge the helpful attitude of the member of the Local Sub-Committee in dealing with various matters of day to day administration placed before them.

The Secretary also conveys his thanks to the Sectional Heads, research workers and all members of the staff of the different Sections of the Committee, from lowliest to the highest with whose co-operation, hard work and devotion to duty the administration has run smoothly and peacefully during the year under report.

In order to carry out researches and investigations into all aspects of jute, the Indian Central Jute Committee has under its organisation the following Laboratories and Departments *viz.* (1) Jute Agricultural Research Institute, (2) Technological Research Laboratories, (3) Economic Research Section including marketing of jute and (4) Publicity Section with the Jute Museum.

In addition to these the Committee has been financing a few schemes of fundamental research on jute under the auspices of (a) the University of Calcutta, (b) Bose Institute, Calcutta and (3) Presidency College, Calcutta.

A short review of work done in the different section of the Committee during the year under report is given below :—

JUTE AGRICULTURAL RESEARCH.

Season.

The season on the whole was not favourable for the jute crop. Continuous early rains interfered with the sowing and intercultural operations. Sowing was pushed ahead in the beginning of the season and fairly good progress was made by the end of April. An unprecedented heavy rain followed during the first half of May and brought about a serious set back in further progress of field work and in growth and development of the earlier sown crop. The soil remained saturated with moisture for long and fields that were ready for sowing were overgrown with grasses and had to be prepared again. The low land jute crop was submerged and destroyed. A seed plot of an *Olitorius* improved strain also failed due to water-logging.

With the improvement of the weather and soil conditions, sowing of the remaining trials were taken up and completed by the first week of June.

Germination in all trials and seed plots was good. The earlier sown crop received intercultures and showed improvement, but no operation was possible in later sown crops as the monsoon set in soon after their sowing, resulting in their failure. Reports of failure of Jute crops due to incessant rain and growth of heavy weeds that could not be removed in time were numerous from the districts.

There was widespread attack of mite, apion and hairy caterpillar and sporadic incidence of soft rot. Control measures were adopted in all cases where possible.

Collection of Types.

17 cultivators' samples of Jute seeds were received and grown. Four of the samples failed to germinate. The rest of the materials were studied and selections were made for yield and other characters.

Due to paucity of staff, sufficient local seeds could not be collected prior to sowing of Jute. A planned collection was arranged as soon as the field staff of the Jute Development Scheme joined. They could send seeds only after 1949 seed crop was harvested. In all 132 samples of seed were received from them by the end of March, 1950. The seeds were preserved for sowing during the next season.

C. capsularis (wild) from Bombay and *C. tridens* collected locally were added to the list of wild species of *corchorus* in our collection. Occurrence of a true wild type of *C. capsularis* is reported for the first time.

Breeding of Improved Jute.

21 breeding trials were carried out with 614 different materials brought forward from previous year's crop. Of these 5 late sown *Olitorius* trials failed due to advent of monsoon soon after their sowing. 9226 selections were made in these trials for further study. Besides, 82 selections were made in multiplication plots of multiple crossing materials not included in trials for shortage of seed.

In the first year test of selections on *Olitorius* selection, 048-525 proved significantly superior to the control (C. G.) in yield by 40%. In all, 43 promising cultures from different trials including trials of multiple crossing materials were carried forward.

Of 825 capsules collected from 11 *capsularis* and 1 *Olitorius* colchicine treated plants, 280 capsules had no seeds. The remaining 545 capsules were sown separately. 2901 *capsularis* and 906 *olitorius* plants were obtained and studied. Only 28 *capsularis* plants showed morphological characters similar to those of polyploids.

5 of the 10 interspecific crosses which yielded some seeds were sown. 3 of the crosses with *capsularis* female parent had apparently all sterile seeds and failed to germinate. The other 2 crosses with *olitorius* female parent gave 41 plants in all. Morphologically these plants looked like normal *Olitorius* plants. Seeds of 6 plants were carried forward for further study.

Seeds of 26 interspecific vegetative grafts were sown. 15 fresh grafts were attempted with 8 successes and seeds from the scions were carried forward.

Inheritance of Characters.

In all 105 selections were sown in a purification series. Cultures breeding true to the type were classified under a pure series. The total number of genetic strains is at present 45.

98 selections from different sources were carried forward, for further study and purification.

The F_1s in the isolation of genotype series were studied and suitable materials were carried forward. Advantage was taken of the segregating multiple crossing materials of known genetic behaviour for isolation of 3 full green, non-branching genotypes and test-crosses were made.

Crosses obtained last year between serrated and ordinary petal types were grown. 6F_1s were carried forward for further study. Progenies of the selection of blotched leaf character were found to be segregating.

The study of the mode of inheritance of pigmentation in a deep red *capsularis* type in our collection, that may be said to be the highest member of the red group, was taken on hand and crosses in all combinations with all other *capsularis* pigmentation types were made.

The mode of inheritance of anthocyanin pigmentation in foreign types and their performance when crossed with Indian types have been taken on hand. Some crosses have been made between available types.

The study of the inheritance of the extra-axillary branching habit in *capsularis* in some foreign strains has been taken up.

A wavy leaf margin type located in our collection was crossed with normal type to study the inheritance of this character.

Segregates in the progenies of a selection, C48-8565, made in old Dacca materials, gave normal plants and plants with deeply serrated leaves. The latter plants were observed to be self-sterile. Crosses were successfully made between normal plants and the leaf-variant using the latter as the male parent. Selections from the normal segregates and crosses were carried forward. The variant was fully described and materials were fixed for cytological study.

Subvention Trials.

Of the 54 trials planned for the 4 provinces, only 45 were sown. Final Reports of most of the trials are yet awaited.

Technological tests of fibre samples from subvention trials are in progress.

Anatomical and Cytological Investigations.

A comparative anatomical study of the stem tips of jute was in progress. Length, breadth and lumen of the ultimate fibres of jute and some important substitutes were measured and studied from the view of their identification.

Chromosome studies of *corchorus* species was in progress. Cytology of colchicine treated jute plants and interspecific crosses were under study.

Physiology.

The Physiology Section in Jute Agricultural Research Institute was started in December, 1949 when the Physiologist took up his appointment. Orders were placed for Laboratory equipments, chemicals and Instruments. Some of the things

ordered have been received and others are awaited. Provisions have been included for appointing other staff in the section. Meanwhile experiments have been conducted on the viability of seeds stored for the last few years, and an elaborate programme for investigations on the different aspects of physiology of Jute and some substitute fibre crops as *Mesta*, and *altissima* was drawn up. Investigations such as—correlative growth rate in different varieties of Jute, during different phases of growth in terms of dry matter; manurial experiments on Jute and *Mesta* and *altissima;* effect of pre-sowing treatments with inorganic salts on growth and drought resistance; and root-growth studies were programmed to be taken up in 1950-51 season.

Cultivation.

In the studies on the possibilities of growing jute in lines, both *Capsularis* and *Olitorius* trials carried out at Chinsurah conditions proved that jute in lines was much more economical and profitable than broadcast growing. The costs of production were lowered by about 20 to 25% and the profits obtained were much higher in line plots than in broadcast plots.

In the manurial experiments with *Olitorius* and *Capsularis* jute, nitrogen applications in the form of Ammonium Sulphate, sludge, compost and Farm yard manure at the rate of 0, 20, 40 and 60 lbs. of nitrogen per acre were tried. The yields progressively increased with greater fertilizer and manurial applications. Under Chinsurah conditions the increase in yield in *olitorius* jute could not be pushed beyond about 39% unlike *capsularis* where the percent increase in yield were very much higher (90 to 95%). Compost gave the highest yield closely followed by N2K2, N2K1 and N1K2. Of the organic sources, nitrogen from the compost gave the best yields. *Olitorius* gave poor increases, with farm yard manure, while with *capsularis* the responses were better.

In the date of sowing experiment with *capsularis* and *olitorius*, earlier sowings in March gave better yields in *capsularis*. For *olitorius* it was found that the earliest sowings

could be done in April successfully provided irrigation facilities are available. In the absence of any irrigation facility the *olitorius* crop under Chinsurah conditions, can only be sown in the end of April or the beginning of May. For both, *capsularis* and *olitorius*, sowings after May did not seem to be economical.

In the stage of harvest studies, harvests at 50% flower stage upto small pod stage, gave better results. Earlier harvests did not seem to be economical.

The trials in the double and triple cropping with jute as the first crop proved, that it is possible to grow successful crops of paddy after jute. The jute in this case has, however, to be harvested somewhat earlier. It is not possible to grow the third crop, after paddy, unless irrigation facilities are available.

Earlier intercultural operations in jute proved better than later operations.

Chemical.

The work of the chemical section could not be taken up during the year with the beginning of the Jute season as Laboratory was not fitted up and also as the appointment of the chemist was delayed.

Effect of different activators in the process of retting was studied. Seeds of *Putranjiva Roxburghii* (Wall) gave encouraging results. Ammonium Sulphate also seems to be promising.

Several strains of micro-organisms were isolated from retting water of which 3 strains under aseptic conditions helped in the process of retting. Soils for proposed sites of the Institute at Krishnagar and Barrackpore were analysed during the year under review.

Diseases.

It was found that earlier sown crops are better adapted to resist infection than late sown crops, as the younger plants are more susceptible in the critical period of infection than the older ones.

It is recommended, that whenever other conditions permit, sowings should be taken up with the early Nor'-wester showers.

Studies on the stem-rot fungus *Macrophomina phaseoli* were continued. Artificial inoculation of soil with sclerotia from culture often failed to induce infection in crop. To investigate this point a series of experiments were carried, on the behaviour of the sclerotia under Laboratory conditions.

The perfect stage of *Sclerotium rolfsi* was found in nature as basidial. It had also been possible to produce the same in artificial culture. The perfect stage can probably be referred to the genus *Corticium*.

More detailed studies were made with 'Chlorosis', in jute. It was possible to induce chlorosis by grafting thus establishing its 'virus' nature. From data, so far collected, there is reason to believe it to be due to seed borne virus.

Selections of stem-rot resistant types were in progress. Out of 153 selections, 52 were brought forward for trials in 1950.

In the continued studies on seed treatment and storage, it was confirmed that retention of viability chiefly depended on the moisture content of the seed at the time of storage and subsequently on the nature of the containers. Air-tight containers like seed-bins were found to be the best.

Both Agrosan GN and 'Landesan' were found to be effective in fungicidal action against *Macrophomina phaseoli* borne through seeds.

Pests

From the field trial on the relative resistance of *Capsularis* and *Olitorius* jute against the stem weevil—*Apion corchori*—it was found contrary to the result obtained under Dacca condition that total damage is higher in *olitorius* jute though *capsularis* suffers more in comparison in early jute season.

It was found that effective method of control lies in (*a*) preventing egg laying, (*b*) evolving resistant types. BHC was found to prevent egg laying to some extent under field condition. Single plant selections were made for study of resistance against *Apion*.

Field trials showed that late sown crop, in general, was less susceptible to *Apion* damage.

Indigo caterpillar was found to be more harmful to early sown crop while jute semi-looper to late sown crop. Mites caused heavy damage to early crops.

Further study on the biology of *altissima* mealy-bug was continued in the laboratory. 1.5% Nicotine Sulphate was found to be effective for control.

Pest & Disease Control Scheme, Tarakeswar.

An area of 200 acres of cultivators' land has been brought within the scope of our intensive study. Our recommended control measures are being tried in these fields and the results and economics thereof are being recorded. In spite of reluctance and apathy on the part of the cultivators encouraging progress has been made.

SUBSTITUTE FIBRES.

Collection of varieties and types:—

Collection of seeds of different fibre plants of the bast fibre group was continued. One thousand bulbils, of *Agave sisalana* were procured from South India and were planted in a nursery for future work. Distinguishing features in the growth and developmental characteristics of various fibre plants were recorded.

Cultivation:—

In the Line Vs. Broadcast experiment with *Hibiscus sabdariffa* var. *altissima*, no significant difference between spacing treatments was observed. In the Line Vs. Broadcast experiment with *Hibiscus cannabinus* (mesta) no conclusive results were obtained.

The crop in the Sunnhemp varietal trial was killed due to an unusual rise in the subsoil water table at the late stage of the crop growth.

No significant differences in yield were found in the two dual purpose Linseed type during the period under report.

Selections based on various characters were made in *Hibiscus cannabinus, Hibiscus sabdariffa* var. *Altissima, Sida rhombifolia, Urena sinuata, Abutilon* Sp.

Ramie plantation at the Chinsurah Farm was further extended and a good quantity of seed was collected for distribution to intending growers.

Anatomical and cytological studies were made with a view to study the characteristics of different fibre plants. A large number of fibre samples received from various sources were identified.

ECONOMIC RESEARCH

The Economic Research Section, which is under Mr. K. C. Basak, Director of Economic Research, carried out a number of important economic investigations particularly with reference to the marketing and transport of jute. The most important among them are summarised below.

(1) Economics of Jute Growing.

The investigation in its second year was carried out at five centres, of which four were the same as in the previous year while the fifth centre in Assam was shifted from Rupohi to Nowgong for better facilities of work. The following are some of the important conclusions drawn from the investigation :—

(*a*) Cost of production for share-rented plots was considerably higher than that for cash-rented plots, which was mainly due to the high rent paid for the former plots by way of half share of the crop.

(*b*) While the accounts of the average farmer in all the five centres of investigation showed net profit on jute, share-rented plots showed net loss.

(*c*) Of the total cost, only a little less than a half had to be incurred in cash (*i.e.*, paid cost) which shows that large scale jute cultivation requires cash money and can be undertaken only by big farmers. For the share-croppers, of course, paid cost was very little, because they took only that much of land which they could manage by their own labour and meagre financial resources.

(*d*) Manure accounted for only 3% of the total cost which, though showed an increase over last year, is still inadequate and much scope lies in improving the yield by the application of more manures.

(*e*) About 80% of the operational cost was human labour cost of which about 55% was hired. Therefore, the availability of labour is very important for which family labour is not sufficient. Labour saving devices such as the use of wheel hoes for weeding (which alone requires about 40% of total labour) will go a long way to solve the problem of labour shortage for increasing jute cultivation.

(*f*) High prices of paddy and rice tend to offset the benefits of high price of jute particularly in the case of small growers who do not grow enough paddy for their own consumption and therefore have to buy paddy by selling jute.

(2) *Improved Methods of Cultivation.*

In order to reduce the cost of cultivation of jute, the Committee directed that improved methods of cultivation evolved by the Jute Agricultural Research Institute should be introduced among jute growers. Accordingly, these methods are being tried out on a small scale under cultivator's condition at the five centres of investigation. Besides demonstration of better methods, the object is to study and compare the cost of production of jute under the improved and traditional methods. The scheme has been planned accordingly. Some technical difficulties in the actual implementation have cropped up which are being investigated.

(3) Study of Mofussil Prices of Jute and other Statistics.

Data regarding arrivals, grade outturn, price etc. for jute and price data for paddy and rice were collected from the five centres of investigation and they have been analysed to bring out the special features of jute transactions in mofussil markets. A special investigation was also undertaken to estimate the parity prices of jute at the five centres of investigation.

(4) Study of American Market for Jute Goods.

The effect of devaluation of the rupee on prices of jute goods in the U.S.A. has been investigated. The following are the important conclusions :—

(*a*) Prices of jute goods in the U.S.A. rapidly increased soon after devaluation, thus offseting its benefits.

(*b*) The basic cause for this rise is the shortage of jute goods against current demand.

(*c*) The rise in dollar prices of jute goods is undesirable for two reasons, namely, (*i*) traders at the American end, taking advantage of the free market there, are having a higher margin of profit at the cost of India's dollar earnings, (*ii*) it will further encourage the use of substitutes for jute.

(*d*) The only corrective from India's end appears to be a further increase of exports of jute goods to the U.S.A.

A study of the consumption of hessian in the U.S.A. in relation to supplies from India also suggests that the falling trend in absolute consumption may perhaps be reversed if the supply of jute goods to the U.S.A. can be increased in the near future.

(5) Jute Substitutes.

Available data and information on substitutes indicate that in the matter of fighting substitutes the most immediate problem is one of adequate supply of jute, the problem of

price coming next in importance. India's drive for self-sufficiency in jute is intended to solve the problem of supply, while a rational and satisfactory solution of the problem of price would be to increase the productivity of the soil as well as of the jute grower by the introduction of scientific methods of agriculture together with the use of mechanical devices.

(6) Statistical Analysis of the Data on Physiology of Jute.

Supplementary statistical analysis of all the experimental data for three years from 1945-46 to 1947-48 and complete analysis of the data for 1948-49 have been done. In all 160 tables have been prepared summarising the results of the analysis.

(7) Revision of the Marketing Reports.

The first draft of the revision of the Second Marketing Report has been scrutinized and the preparation of second draft has made good progress which will be submitted to the Publication Sub-Committee soon.

(8) Survey of Jute Transport Position.

Regular investigations were made regarding transport bottlenecks during the 1949-50 season and the Committee's Local Sub-committee, the Raw Jute Movement Committee and the Government of India were kept informed about them for appropriate action. It may be mentioned that transport difficulties that were experienced in 1949-50 were actually foreseen in reports submitted in the latter part of 1948. It is also gratifying to note that many of the remedies suggested in these reports were given effect to during 1949-50.

(9) Transport Possibilities from Jalpaiguri and Cooch Behar.

Devaluation having created a trade deadlock between India and Pakistan, the question of transporting jute from Jalpaiguri and Cooch Behar became particularly acute. A survey was, therefore, undertaken to explore the possibilities of finding alternative routes for despatch of jute from these two districts. Suitable recommendations were made on the basis of the survey which were forwarded to the Government of India.

(10) Marketing & Transport Survey.

In order to investigate the difficulties which might crop up in the 1950-51 season when a large jute crop is expected to be marketed, a comprehensive marketing and transport survey was undertaken covering all the jute growing states in India, including new areas such as U. P., Madras and Travancore. Apart from the collection of detailed information regarding marketing and transport of jute, particular stress was laid on examination of the possibilities of organising purchases through agents appointed by the Indian Jute Mills Association and organising growers' co-operative jute sale societies. A detailed report of the survey has been prepared in which specific remedies for different areas have been suggested for removing marketing difficulties and transport bottlenecks as far as possible.

(11) Co-operative Jute Sale Society in North Bihar.

A scheme for organising a Jute Growers' Co-operative Marketing Union in Purnea (Bihar) has been received from the Registrar of Co-operative Societies, Bihar. It has been examined in the light of past experiences of the Committee with regard to co-operative societies and on the background of the marketing problems of North Bihar, and a note embodying comments and suggestions on the scheme has been prepared.

(12) 'Jute Futures' in Bihar.

An enquiry on the 'Jute Futures' market said to have been operating in North Bihar was undertaken. The enquiry revealed that owing to the ban on 'Jute Futures' in West Bengal, some speculators had transferred their activities to certain places of Purnea district in North Bihar. It was suggested that the Government of Bihar should pass an ordinance banning 'futures' trading in raw jute.

(13) Low Prices of Jute in North Bihar.

A survey was undertaken to enquire into the causes of low prices of jute in certain parts of North Bihar, such as Supaul

and Saharsa. The enquiry revealed that the price decline was due mainly to lack of transport facilities and absence of organised markets. A report incorporating suggested remedies was forwarded to the Governments of India and Bihar for consideration.

(14) Jute Position in Nepal.

In the early part of 1949-50 season, a survey was made of the position regarding the supply and distribution of jute obtaining in Nepal. The survey revealed that the jute acreage of Nepal in 1949 had increased by 25% over 1949, but on account of crop damage, the total output was expected to be the same as in previous year. Estimates were also made of the probable distribution of the crop for consumption by local mills and for export.

(15) Prospects of Jute Sowings.

While carrying out the marketing and transport survey, information was collected from important jute growing areas regarding the prospects of jute sowings in 1950 and a survey was made of the effects of disturbances in the early part of 1950 on jute cultivation. It was revealed that in some parts of West Bengal, Assam and Cooch Behar, jute sowings were likely to be adversely affected on account of the migration of muslim cultivators. Other jute growing states were expected to increase jute acreage.

A survey was also made of the seed position in the different jute growing areas.

(16) Substitute Fibres in India.

An enquiry regarding substitute fibres that are grown in India has revealed that sunn hemp is by far the most important of all substitute fibres, Mesta coming second in importance. Substitute fibres are generally grown for commercial use in such areas or tracts where jute is either absent or only grown to a limited extent. Some information has also been collected about the use of these fibres.

(17) Dissemination of Calcutta Loose Jute Prices.

Calcutta price quotations were sent out bi-weekly to 46 selected centres of the jute growing states as also to the five centres of investigation for dissemination among the jute growers. The service was also extended to the 76 members of the Development staff of the Jute Agricultural Research Institute.

(18) Sales Tax on Raw Jute.

An enquiry was made about the tax on sales of raw jute and its incidence. Such taxes are imposed in West Bengal (where it is a "Purchase tax"), Bihar, Assam and Orissa. The enquiry revealed that in actual practice the incidence of the taxes was in most cases pushed back and passed on to the cultivators through different middlemen.

(19) Collection of Jute Samples.

In course of the marketing and transport survey, jute samples were collected from different areas for the Committee's Technological Research Laboratories. Booking restrictions, however, did not permit the collection of a large number of samples.

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(20) Miscellaneous Enquiries.

A large number of miscellaneous enquiries were attended to and notes on specific subjects and information on trade matters were furnished to various Government departments and commercial bodies.

TECHNOLOGICAL RESEARCH ON JUTE

Mr. C. R. Nodder, O.B.E., M.A. (Cantab), retired from the directorship of the Technological Research Laboratories on the 18th July 1949 after about 12 years of valuable service, handing over charge of duties to Dr. P. B. Sarkar. The Work done during the year under review is summarised below.

BACKGROUND RESEARCH (CHEMICAL)

One of the main constituents of the hemicelluloses of jute fibre has been isolated in more or less pure form and its composition ascertained. This appears to consist of six anhydro-xylose units linked to one mono-methoxy-uronic acid and represents about half the total hemicelluloses present in the fibre. It is a white, amorphous powder, highly hygroscopic, and seems to be largely responsible for the high moisture regain value of jute compared with other cellulosic fibres.

A sample of jute yarn, bleached with 'Textone' (sodium chlorite) was stored for more than two years to see how, if at all, the strength deteriorates with time. Portions were tested periodically; it has been observed that the loss in strength is not appreciable. Jute fat and wax were subjected to a preliminary examination; it has been found that the saponification value varies from sample to sample and may lie between 125 and 191, the iodine value is quite low but the unsaponifiable matter fairly high. Since the amount of fat and wax largely varies with the solvent employed for their extraction, it is necessary to mention the solvent while giving figures for natural fat and wax in jute.

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A fairly large number of tests carried out with jute yarns under various conditions indicate that copper—chemically bound or mechanically deposited—is very effective as a rot-proofing agent. Addition of a little chromium to the copper appears to enhance its efficiency. Presence of batching emulsion seems to accelerate the deterioration of jute yarns on exposure. Soil burial tests are not expected to yield very concordant results as identical conditions are difficult to obtain.

Experiments on bleaching jute with hydrogen peroxide have shown that the shade obtained does not turn yellow so quickly as with sodium chlorite, the wet strength retained is more or less the same in both cases. The loss in weight is small in peroxide bleaching which removes very little lignin unlike

chlorite bleaching. By "mixed bleaching" *e.g.*, hypochlorite followed by peroxide, the cost may be somewhat reduced; the results being quite good.

Further work with sugar bags in small-scale trials indicates that monochlorophenol is quite effective in delaying syrup formation when sugar is stored in jute bags in humid atmosphere. The higher the relative humidity, the quicker, of course, the syrup formation.

BACKGROUND RESEARCH (PHYSICAL)

Torsional rigidity of single jute filaments has been measured and the results have been communicated for publication. The distribution of rigidity moduli is notably asymmetric; the mean rigidity modulus is not appreciably affected by batching. Creep and creep recovery properties of single jute filaments have been studied and a paper embodying the results has been sent for publication. A considerable lag between the instantaneous extension and contraction has been observed on loading and unloading a wet jute filament. The creep under load appears to bear a linear relation with the logarithm of duration of loading under identical conditions.

Further work on the frictional properties of jute fibre done during the year, confirms the earlier observation that solvent extraction (that is, removal of fat and wax) increases the co-efficient of friction. While flax and hemp have more or less the same co-efficient of friction as jute, mesta, rosella and ramie have much higher values. An approximate linear relationship exists between the co-efficient of friction and the relative humidity, the former increasing with the latter. Another important fact observed was that batching emulsion increases the friction between fibre pads but does not appear to lubricate the fibre strands. The water present in the batching emulsion seems to be mainly responsible for the increase in friction, the contribution of oil being comparatively less.

TESTS ON JUTE AGRICULTURAL RESEARCH INSTITUTE SAMPLES

In all, 167 samples of jute from Jute Agricultural Research Institute have been spun and tested during the year under review and the results communicated to the Director in time so that they may be utilised in planning for the next year's experiments. These samples were from investigations on effect of spacing, time of sowing, manurial trials, etc. The results are fairly conclusive in some cases but not in others as is natural with investigations of these kinds.

TESTS ON MURSHIDABAD COMMERCIAL SAMPLES

Thirty commercial samples of jute from five centres in the Murshidabad district were examined for quality with the object of making these data available to the mills for proper blending. Most of the samples had quite high quality ratios.

MADRAS JUTE TRIALS 1949

Eight samples of jute grown in Madras were tested in these Laboratories and the results indicate that all except one were of high quality.

TESTS ON SUBVENTION FARM TRIALS

Samples of subvention farm trials in West Bengal, Orissa, Bihar and Assam, numbering 129, were examined for quality and the results sent to the Director, Jute Agricultural Research Institute, before the next sowing time.

TESTS ON COMMERCIAL JUTE SAMPLES

Commercial samples of jute are difficult to obtain under the existing circumstances from all important centres. Some have been received late in the year, these would be tested early next session.

JUTE SUBSTITUTES

Four samples of linseed fibre obtained from the principal, H. B. Technological Institute, Kanpur, were spun either alone or mixed with jute and the resulting yarns were woven into sacking cloth in a Calcutta mill. The results were quite satisfactory; the experiments indicate the possibility of using a fairly large proportion of linseed fibre in the jute industry. If this materialises, it is expected that the situation due to shortage of jute in the Indian Republic would be eased to some extent. The presence of shives in the bags made with yarns spun from unretted linseed fibre is a drawback but such bags may be used for purposes for which these shives are no objectionable feature.

CO-OPERATION WITH THE INDUSTRY

A number of substitute fibres used in the jute mills have been examined in the spinning and testing laboratories in order to find the optimum mixtures with jute for specific purposes. The results, which are almost ready, will be communicated to the mills in due course.

Eighteen technological research leaflets were prepared, printed and distributed liberally amongst mill managers and other officers through the Indian Jute Mills Association Research Institute. Important matters relating to the science and technology of jute have been described in these in a popular way. "A Review of the Position reached in Technological Research on Jute" was prepared by Mr. C. R. Nodder and published by the Committee. This gives an up-to-date summary of the more important work done in these Laboratories since 1938.

PUBLICITY

During the year under report Mr. M. C. Mukherjee, M.A., Publicity Assistant, was put in charge of the Publicity Section, owing to the death in December 1949 of Mr. K. I. A. Quaderi, Publicity Officer, who had been on leave since March 19, 1949 on ground of illness.

The progress of work of the Publicity Section has been satisfactory. The monthly Jute Bulletin, which is an important publication of the Committee with world-wide circulation among the Jute Interests, was regularly brought out within the first fortnight of every month.

Considerable improvement has also been effected as regards the quality and volume of the journal. Indian and foreign journals have often taken due notice and published important news items appearing in the Jute Bulletin.

Fifty Press and unofficial Notes were issued by the Publicity Section during the period under review. These were well received by the Press.

Extracts from important communiques were broadcast by the Calcutta Station of the All-India Radio.

There have been further additions to Jute Museum's exhibits. Thanks are due to Messrs. M. P. Birla and K. D. Jalan for supplying, free of cost, Jute carpets of various shades and designs as exhibits.

The Committee's Museum also participated in two exhibitions, one in Delhi and the other in Calcutta.

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APPENDIX I

ANNUAL REPORT OF THE JUTE AGRICULTURAL RESEARCH INSTITUTE, (1949-50)

INTRODUCTION

This is the second report of activities of Jute Agricultural Research Institute after the new set up at Hooghly after partition. Out of 52 acres of land placed at our disposal only 33.9 acres were under cultivation, the remaining being occupied by low or marshy land, road and tanks. Of the 33.9 acres of land under cultivation 3 acres were taken away by the Economic Botanist, Agricultural Department, West Bengal, one acre was retained by the Farm Manager and 3 acres were put under permanent grass. We had thus 26.9 acres of land in all, available to us. We covered in Kharif season about 30 acres with our crops during the year under report, of which 3.1 acres were low lying lands. Jute occupied 26 acres and the rest was under Substitute Fibre crops. About 8 acres were under Seed Multiplication of improved seed and 18 acres under experimental jute crop.

Shortage of land was acutely felt for fitting up of experiments resulting in dropping of some of our experiments and reducing the plot sizes very much, in others.

For the first time, crops other than jute and other fibres were grown in an area of 17.56 acres during the year under report after the harvest of our experimental fibre crops. The acreages under other crops were as follows:—(1) Paddy—7.0 acres, (2) Gram—5.66 acres, (3) Lentil—1.00 acre, (4) Khesari—1.50 acres, (5) Vegetables—1.00 acre, (6) Wheat—0.40 acre and (7) Berseem—1.00 acre.

These extra crops (other than jute and substitute fibres) were grown on a profit basis. These crops greatly helped in keeping the weeds suppressed for the successive jute crop.

The necessity of a properly equipped farm of our own and laboratory and essential staff quarters on or near the farm was very much felt. The staff did their best under most trying conditions.

SEASON

The season on the whole was not very favourable for jute crop. Heavy and continuous early rains in the beginning of May, interfered with sowing and intercultural operations, resulting in poor crop growth. Some of the experimental crops were submerged under water and were totally lost. In the Chinsurah Farm which is mainly a paddy farm, attempts are made by the West Bengal Agricultural Department to arrest and store all the rain water, whereas for jute we are anxious to drain out the excess water.

The data on rainfall and number of rainy days, in the year under report, are given below:—

Months	*Number of rainy days*	*Total rainfall during the month (inches)*
1. April, 1949	11 days	6.67
2. May, 1949	12 ,,	17.08
3. June, 1949	15 ,,	11.02
4. July, 1949	25 ,,	16.59
5. August, 1949	19 ,,	7.49
6. September, 1949	23 ,,	11.75
7. October, 1949	13 ,,	5.68
8. November, 1949	—	—
9. December, 1949	—	—
10. January, 1950	—	—
11. February, 1950	2 days	0.37
12. March, 1950	3 ,,	1.58
Total—	123 days	78.23

The heavy attacks of Mites and Apion that followed the incessant and early rains further caused serious damages to the crop.

BREEDING AND GENETICS OF JUTE

I. Collection of Varieties and Types

17 local types of jute were received and grown during the season. 4 types failed to germinate. The rest of the types were studied and selections were made for yield and other characters.

Due to paucity of staff, sufficient number of local types could not be collected prior to the sowing of the jute crop. In all 132 samples of jute seeds including 76 *capsularis* and 56 *olitorius* materials were received by the end of March, 1950 and were preserved for sowing during the following season. We received so far 837 samples of local jute seeds including 567 old collections brought from Dacca, since we started work at the Chinsurah Farm. A good number of the local types, sown so far, failed to germinate. Of the rest, the more promising types will be retained for further study.

Wild Species of Corchorus.—4 wild species of Corchorus *viz.*, *C. acutangulus*, *C. fasciculatis* and *C. siliquosus* and a wild type of *C. olitorius* were carried forward. Another wild species *C. tridens* was collected locally and a wild type of the cultivated species *C. capsularis* were received from Bombay. All these materials were grown. Their morphological characters were studied and selections for isolation of different types were made. Materials from them were also fixed for cytological studies.

C. capsularis received from Bombay exhibited all the characteristics of a wild species. Its dwarf bushy habit, smaller capsule and seed, etc. are similar in respect of the characters of the wild *C. olitorius* which is so common in almost all the provinces in Indian Union. This is the first report of the occurrence of a true wild *C. capsularis* in the Indian Union. The old belief that *C. capsularis* is not indigenous and that it is an introduction from China may have to be revised in the light of this observation. The material which is under study, at present, was found to be heterozygous for pigmentation. Unlike in the cultivated types of *C. capsularis*, commonly met with in the jute growing areas, green-light red plants were found to be dominant in a mixed population of green-light red, light red and all green plants. Green-light red and light red plants are rare in cultivated types. Detailed studies of this wild material with a view to ascertain its value as a useful breeding material has been taken in hand.

II. BREEDING OF JUTE:

Twenty-one breeding trials were sown with 614 cultures carried forward from the previous year's crop. Of these, five *olitorius* trials, sown late, during the first week of June, were rejected for poor growth of the pants due to continuous heavy rains after the sowing of these trials. This resulted in failure of the crop.

In all, 1056 primary and 7170 secondary selections were made and pigmentation, height, base diameter, non-branching habit, if present, date of first flowering, etc. of individual selections were noted. Seeds were collected from them separately and preserved for further study. 110 promising cultures from multiple crossing materials that could not be included in trials, for shortage of seed, were multiplied and 82 selections from them have been carried forward for study in the next season.

Primary selections.—30 *capsularis* and 11 *olitorius* district types were grown and studied in randomized layouts. The *olitorius* trials, sown during the first week of June, failed tor reasons stated earlier. 600 selections were made in the *capsularis* trials for further study. The yield data of these trials were analysed. Only 5 of the local types proved to be quite good and another type "Rowta" collected from Dalgaon, Assam, gave 19% higher yield than the control (D 154).

Of the 17 cultivators' samples of jute seeds, sown in single plots, there was no germination in 4 plots. In the remaining 13 plots 5 of *capsularis* and 8 *olitorius* types, 60 primary selections were made.

Besides, 396 plants were selected in 4 *olitorius* first year trials that failed due to late sowing. These were treated as primary selections.

Thus altogether 1056 primary selections were made for further study.

First year test of selections.—Of 1583 primary selections made in the previous year 293 selections, of which 137 were *capsularis* and 156 *olitorius*, were carried forward after drastic

rejection of the bulk of them on the basis of their performances of height, basal diameter and earliness.

137 *capsularis* selections were tested in 5 replicated progeny row trials (including 13 selections from Deshimara, reported last year). 2110 secondary selections were made in them for further study. A good number of the selections were as good as the control (D154) in yield but none of them proved significantly superior though some selections gave 12 to 14% higher yields than the control. 26 cultures were carried forward for test during the following season.

156 *olitorius* selections were sown in 6 replicated progeny row trials; 4 late sown trials, as stated previously, were rejected. 972 secondary selections were made in the remaining 2 trials. One selection, 048-525, was significantly superior to the control (C. G.) yielding 40% higher. Besides, there were a good number of other selections that were as good in yield as the control. 8 cultures were carried forward for further test.

Second and sixth year combined test of selections.— 8 families with 40 progenies brought forward from the first year test of selections along with 2 families with 10 progenies from the fifth year materials of last year were tested in a compact family block layout. 600 selections were made in the progenies. The result of analysis of the yield data showed that 7 families out of 10 were as good as the control in yield, but none proved significantly superior. Three families including C47.Nj-279, reported last year, were carried forward for further tests.

Third, fourth and fifth year test of selections.— There were no materials at the third, fourth and fifth year stages, for tests, during the year under report.

Test of selections in multiple crossing materials.— 40 cultures with 230 progenies, brought forward from the previous year's trials, were tested in 5 compact family block layouts. The materials were studied for such desirable characters as non-branching habit, earliness and resistance to diseases, besides, performances with regard to height, base diameter and genetic purity. 3488 selections were made in the progenies for further study.

The yield data were analysed. On the results of this analysis 6 families were carried forward.

110 selections that could not be included in trials for shortage of seed, were grown in single plots for multiplication. 82 selections were made in them on the basis of their performances.

Polyploidy and interspecific hybridization in jute.— 825 capsules collected from 11 *capsularis* and 1 *olitorius* colchicine treated plants, which appeared to be polyploids from a study of their morphological characters, were examined. 280 capsules had no seeds. The remaining 502 *capsularis* and 43 *olitorius* capsules were sown in separate lines. Germination was on the whole poor, due mostly to partial sterility characteristic of polyploids. 2901 *capsularis* and 906 *olitorius* plants were obtained. All these plants were studied; only 28 *capsularis* plants showed morphological characters similar to those of polyploids. Seeds were collected from these plants separately, capsule-wise for fixation of polyploid *capsularis races*. Fresh materials were also fixed from them for cytological study and confirmation. None of the *olitorius* plants maintained the polyploid feature observed in the parent. Fresh treatment of both *capsularis* and *olitorius* seeds with colchicine will be undertaken during the coming season.

Of the 10 crosses between expected polyploids of the two species only 5, which yielded some seeds, were sown. Three of them with *capsularis* as the female parent, gave apparently all sterile seeds and did not germinate while the other two with *olitorius* female parent gave 41 plants in all. Morphologically these plants looked like normal *olitorius* plants. Seeds of 6 plants were carried forward for further study.

Vegetative rapprochement as a means of overcoming interspecific cross incompatibility in Jute.—Seeds of 26 grafts between *capsularis* and *olitorius* brought forward, were sown in lines. Sowing was late and monsoon set in soon after sowing. There was good germination but the plants did not grow well because no interculture could be given to them, the soil remaining continuously wet. The plants were too thin and stunted for further grafting amongst them. Seeds were collected from the selected plants and carried forward.

15 fresh grafts were tried of which 8 were successful. Seeds were collected from them and preserved for further work during the following season.

III. INHERITANCE OF CHARACTERS :—

Genetic strains.—In all 105 selections, including 23 obtained from Dacca materials, were sown in a purification series. The progenies of the individual selections were studied and the cultures breeding true for the different characters were noted. The cultures were classified later under a pure series. We were thus able to have in our collection 45 strains representing the different characters and combinations of them. Such characters as pigmentation patterns, non-branching habit, leaf shape and size including shape of the leaf-margin, stipule characters, non-bitter *capsularis*, corolla colour and shape, anther colour, pod size and shape including oval pod, etc., have already been represented in our collection.

98 selections from different sources were carried forward for study under a purification series during the next season. The work will be continued and fresh strains will be added to the list from year to year as new characters are fixed.

Isolation of genotypes.—Crosses between Dhaleswar and the three members of the red group were grown in the F_1 stage. The F_1s were studied and confirmed. 2 F_1s from each of the three types of crosses were carried forward. These would be grown next season for isolation, of the desired 5 full green genotypes after test crosses in the F_2 population.

The segregating multiple crossing materials of known genetic behaviour were advantageously used for isolation of three full green non-branching genotypes and test crosses were made.

Serrated petal.—Crosses between the ordinary petal and the serrated petal types in *olitorius* were grown. The F_1 plants produced flowers with serrated petal. 6 F_1s were carried forward for study of their performance in F_2.

Blotched leaf.—One selection with intensely red blotches on the leaves was carried forward and grown. The progenies were found to be segregating for the blotched-leaf character. The material was put in the purification series under genetic

strains. The inheritance of this character would be studied later when fixed materials are obtained.

Anthocyanin pigmentation.—Indian capsularis anthocyanin types were classified into three groups, *viz.* (1) full green, (2) green-pigmented and (3) red. Under the 3 groups 7 types were reported in the first instance. One green-light coppery red in group (2) above was reported later. The mode of inheritance of these 8 anthocyanin types has already been investigated. Yet another type in the red group that may be termed "deep red," in fact, the highest member in the red group known, was maintained in our collection but its mode of inheritance remains to be studied. Crosses were made in all combinations of this type with all other types, except the green-light coppery red with a view to complete the study of the known capsularis anthocyanin types. The mode of inheritance of anthocyanin pigmentation in Foreign types and their performance when crossed with Indian types, have been taken in hand. Some crosses have been made between available types.

Extra-axillary branching habit.—The Indian *capsularis* types are as a rule branching and the branches are axillary. But some of the foreign *capsularis* types in our collection, such as, Halmahera and Jap Rd., are non-branching throughout the vegetative period. These types would branch only prior to entering the reproductive phase. Such branches are extra-axillary. This character was observed to be constant.

With a view to study the mode of its inheritance crosses between Indian types and the non-branching foreign types were made.

Repand (wavy) leaf type.—One type breeding true for the character of repand leaf-margin was located. This character was observed for the first time. To study inheritance of this character, crosses between normal leaf type and the new leaf type were made.

Leaf variant.—One selection, C48-8565, grown in the *capsularis* first year test of selections segregated giving normal and variant plants. The variant plants were characterized by deeply serrated leaves. Seeds from the variant plants could not be carried forward as they were self-sterile, but crosses between a normal and the variant, using the latter as the male parent,

were successfully made. Selections from the normal segregates and the crosses were carried forward for further study. Materials for cytological studies were also fixed.

IV. SUBVENTION TRIALS.

Seeds for 54 subvention trials, 20 in West Bengal, 12 in Bihar, 12 in Assam and 10 in Orissa, with their sowing plans, necessary instructions for conduction of the trials and final report forms were sent to the Jute Inspectors in West Bengal, Bihar and Assam and to the Deputy Director of Agriculture, Orissa in proper time. 9 trials could not be sown for various reasons, such as, difficulty of getting suitable cultivator's plot, late receipt of seeds due to postal irregularities etc. Of the 45 trials sown, final report of 13 trials only reached this office so far. Final reports of 32 trials are awaited including 9 trials of Orissa, where one trial could not be sown.

Technological tests of samples of fibre sent from some of these trials are in progress. Some reports on the result of quality tests, already carried out, have been received. No conclusion can be drawn at present in the absence of final reports of the remaining trials.

ANATOMICAL AND CYTOLOGICAL INVESTIGATIONS.

Identification of vegetable fibres:—During the period under report 21 samples were received from different sources for identification and also comparison with jute. The fibres were studied and necessary reports on their physical characteristics and colour reactions were supplied to the senders.

In view of the growing importance of jute substitutes, characteristics of some important fibres *viz.* Jute, Mesta (*Hibiscus cannabinus*), Roselle (*H. sabdariffa* var. altissima), *H. abelmoschus*, *Sida rhombifolia*, Congo jute (*Urena lobata*), *Malachra capitata* and *Abroma augusta*—were studied. The fibre cells show a great range of variation in length, lumen and ends. Not much published data are available on these points. Hence the study of the length, width and lumen of the ultimate cells in three different regions of the plant—bottom, middle and top—was undertaken. 100 fibres were taken for length measurements and 25 each for width and lumen measurements. The results are given in table I.

TABLE—I

Sl No.	NAME	BOTTOM				MIDDLE				TOP			
		Length		Width	Lumen	Length		Width	Lumen	Length		Width	Lumen
		Mean	S.E.	Mean	Mean	Mean	S. E.	Mean	Mean	Mean	S. E.	Mean	Mean
		in mm.		in microns		in mm.		in microns		in mm.		in microns	
1.	Corchorus capsularis (D 154) ...	1·790	±0·047	21	9	2·759	±0·097	24	5	3·137	±0·092	18	4
2.	C. olitorius (C.G.) ...	1·834	±0·034	20	7	2·211	±0·024	19	4	2·448	±0·058	18	4
3.	Hibiscus cannabinus ...	2·269	±0·043	20	6	3·328	±0·082	21	4	3·825	±0·096	22	4
4.	H. sabdariffa var altissima ...	2·400	±0·043	19	8	3·110	±0·065	23	3	3·674	±0·075	21	3
5.	H. abelmoschus ...	2·109	±0·037	26	13	3·425	±0·090	24	4	2·820	±0·040	21	7
6.	Sida sp. ...	1·240	±0·024	16	5	1·558	±0·042	14	3	2·629	±0·179	14	3
7.	Urena lobata ...	1·678	±0·061	15	3	2·962	±0·094	15	3	3·489	±0.080	16	3
8.	Malachra capitata ...	1·945	±0·047	20	6	2·757	±0·061	18	3	3·334	±0·071	18	4
9.	Abroma augusta ...	2·296	±0·043	15	4	2·140	±0·027	19	5	1·522	±0·041	15	4

It will be seen from the data that the length of the ultimate fibres increases significantly from bottom to top, while the width of lumen decreases. Taking into consideration the errors likely to arise from sampling and measuring, it may be said that Hibiscus fibres can be differentiated from those of jute by their greater length and Sida from Jute by their shortness. While it is difficult to differentiate Urena fibres from jute, presence of calcium oxalate crystals, and narrow width and lumen are likely to help in identification.

Of some of the chemicals and stains used for colour reactions, phloroglucinol is found helpful in differentiating Mesta (*H. cannabinus*) from jute. The crimson colour fades in 15 to 20 minutes in the case of *Hibiscus*, *Urena* and *Malachra* materials to very light colour, while jute, *Abroma* and *Sida* fibres retain the deep colour for a few hours.

Anatomical studies:—The work on the comparison of cambial activity between vegetative and flowering shoots is in progress.

Cytological studies:—Sections from some of the polyploid (Colchicine-treated) materials were cut and examined. So far no induction of polyploidy has been noticed in the 6 plants selected. The work is in progress.

The undernoted materials were fixed, dehydrated, cleared and infiltrated and made into blocks for detailed study: (*a*) interspecific crosses between polyploid materials; (*b*) materials from prominent cultures of Colchicine-trated plants (1st generation); (*c*) wild jute species; (*d*) Capsularis leaf mutant; (*e*) leaf variants—*capsularis* and *olitorius;* (*f*) interspecific crosses between *C. capsularis* and *C. olitorius* at different hours.

JUTE PHYSIOLOGY.

The Physiology Section was started in December 1949, when the Physiologist was appointed. A Physiological Laboratory is being rapidly equipped.

As there was no crop in the field when the Physiologist joined, no physiological work except some laboratory investi-

gations on the seeds kept under storage was possible during the period under report. A planned programme on the different aspects of Physiology of jute and other fibre crops have already been drawn up on the following lines :—

(1) Retention of viability in different varieties of Jute seeds both wild and cultivated.

(*a*) The different causes for the slow decrease in the germination percentage of Jute seeds are to be investigated in all its aspects.

(2) Nutritional Investigations :—

(*a*) Effect of different sources of organic and inorganic nitrogen on vegetative growth and initiation of flowering in Mesta (*H. cannabinus*) and Roselle (*H. sabdariffa* var. *altissima*) under field conditions.

(3) Studies in the comparative root growth in different varieties in correlation with (*a*) different phases of growth, (*b*) different nutritional levels.

(4) Cultural Investigations :—

(*a*) Salt toleration in different varieties of jute. The effect of different concentration of salts, NaCl and KCl at different stages of growth with a view to find out salt resistant types.

(*b*) Effect of different pH range on growth.

(5) Studies in the water relation with different levels of nitrogen fertilizers.

CULTIVATION.

(*i*) *Line Sowing* :—

To study the possibilities and economics of growing jute in lines, as compared with the usual broadcast growing and to test the quality of fibre as influenced by spacing, two trials, one with *capsularis* and one with *olitorius* jute were carried out

during the year. The spacing treatments studied in both these trials were light thinning × 12″, 2″ × 12″, 3″ × 12″, 4″ × 12″ and broadcast as control.

The data on yield, cost of production and profit values for each treatment in the two trials are *given below in table II.*

TABLE II.

Lay-out :—Replicated randomized blocks in 6 replications.
Effective plot size = 0·0114 acre.

C. capsularis (D154.) Sown on 12-4-49 and harvested on 26-8-49.

Spacing treatments.	Cost of cultivation per acre. Total	Percent on control.	Cost of production of 1md. fibre.	Yield per acre md.	Profit value of fibre per acre @ 30/- per md.	Percent of profit against broadcast.
	Rs. A. P.		Rs. A P.		Rs. A. P.	
A. Broadcast...	296 2 0	100·0	21 12 0	13·57	110 15 6	100·0
B. Light thinning x12″	221 4 0	74·7	14 8 0	15·21	235 0 6	211·80
C. 2″x12″ ...	234 7 9	79·2	15 12 0	14·76	208 4 3	187·45
D. 3″x12″ ...	226 10 9	76·6	14 6 0	15·71	244 9 9	220·43
E. 4″x12″ ...	230 8 6	77·9	14 1 6	16·35	259 15 6	234·27

P = 0·05 ; C. D = 1·67 mds ; S. E% = 0·05.

C. olitorius.—(C. G.)

Sown on 5. 5. 49 and harvested on 11. 10. 49.

A. Broadcast...	390 2 3	100·0	13 3 2	29·5	494 13 9	100·0
B. Light thinning x12″	324 5 0	83·1	9 9 10	33·7	686 11 0	138·76
C. 2″x12″ ...	320 3 9	82·1	9 9 3	33·4	681 12 3	137·77
D. 3″ x12″ ...	317 14 6	81·5	9 10 1	33·0	672 1 6	135·82
E. 4″ x12″ ...	318 1 6	81·5	9 10 7	32·9	668 14 6	135·17

P = Large ; S.E% = 4·38.

It will be seen from the table that the *capsularis* yields were rather low. This was due to continued water logged conditions in the early stages of crop growth in the low land where the experiment was conducted. In the *capsularis* trial it will be seen that the cost of production in line plots is lowered by about 25 percent than in the broadcast plots. The yields have increased significantly in line plots, and profits also are much higher than in broadcast.

In the *olitorius* trial the costs of production in line plots is reduced by about 20%. The yields in line plot increased, though the increases were not significant, and the profits were much higher than in broadcast plots.

II. MANURIAL TRIALS:

To study the effects of varying doses of nitrogen, potash, organic manures and inorganic fertilizers on yield and quality of fibres, two trials with *capsularis* and *olitorius* in randomised block lay-outs were carried out during the season at Chinsurah Farm.

The effect of these manures and fertilizers were studied at different levels and combinations thereof. Fertilizers applied and yield of fibre obtained per acre, approximate profit values and data on random plant studies for the respective treatments are given below separately for each trial in table III and IV (*capsularis*) and V and VI (*olitorius*).

TABLE III

C. capsularis (D 154)

Lay-out—Replicated randomised blocks in 4 replications, effective plot size=0·002 acre. Sown on 28-4-49 & harvested on 31-8-49.

Treatments	Yield per acre in mds.	Percent on control	Value @ Rs. 30/- per md.	Cost of fertilizer per acre	Cost of cultivation per acre including fertilizer	Net Profit per acre
			Rs. As.	Rs. As.	Rs. As.	Rs. As.
1. Compost	37·3	190·4	1119 0	*	355 0	764 0
2. N_2 K_1 ...	36·2	184·6	1086 0	59 11	411 11	674 5
3. N_2 K_2 ...	35·7	182·3	1071 0	69 6	419 14	651 2
4. N_1 K_2 ...	34·0	173·5	1020 0	44 6	390 6	629 10
5. N_2 ...	33·9	172·9	1017 0	50 0	396 0	621 0
6. N_1 K_1 ...	32·2	164·5	966 0	34 11	373 3	592 13
7. N_1 ...	30·2	154·1	906 0	25 0	357 0	549 0
8. F. Y. M.	29·8	152·0	894 0	37 8	368 8	525 8
9. K_2 ...	28·7	146·4	861 0	19 6	342 14	518 2
10. Sludge	27·6	140·7	828 0	*	320 0	508 0
11. K_1 ...	27·0	137·7	810 0	9 11	328 11	481 5
12. No Manure	19·6	100·0	588 0	...	292 0	296 0

P=0·01 ; C. D.=3·62 ; S. E%=3·1

N_1 = Ammonium Sulphate @ 1·8 mds. or 30 lbs. of N per acre

K_1 = Muriate of Potash @ 0·6 mds. or 25 lbs. of K_2 0 per acre.

Compost @ 150 mds. per acre. Sludge @ 150 mds. per acre ;

F. Y. M. @ 150 mds. per acre

*Compost and sludge were obtained free from W. B. Agriculture Department and the cost is not known.

CONCLUSIONS.

1. Application of both N & K when used alone increased the yield, the yield increasing more with increased doses. N, however, gave much higher yield than K. Combinations of N & K gave better results.

2. Compost gave the highest yield, closely followed by N_2K_1 & N_2K_2.

3. Increase in yield from F.Y.M. was slightly more than sludge.

TABLE IV

Manurial trial No. 1 (capsularis)

Average height, base diameter, green weight, etc. of plants in the different treatments.
(Based on 10 random plants per plot or 40 plants per treatment)

Treatment.	Plant height (cm)	Base diameter (cm)	Green wt. per plant (gms)	Fibre wt. per plant (gms)	Weight of leaves & branches (non-fibre producing) (gms)	Wt. of clean stem (gms)	Weight of Jute stick per plant (gms)	Ratio of fibre, per cent, to green weight of plant.
1. Compost ...	352·1	2·37	486·9	26·6	61·9	425·0	55·0	5·50
2. N_2K_1 ...	331·8	2·05	346·9	20·2	52·5	297·0	56·6	5·82
3. N_2K_2 ...	344·1	2·20	399·0	25·5	50·3	348·8	63·3	6·50
4. N_1K_1 ...	333·4	2·12	354·0	21·6	49·5	304·5	48·6	6·12
5. N_2 ...	331·2	2·12	360·8	18·8	50·1	310·7	49·7	5·40
6. N_1K_1 ...	332·8	2·00	318·3	18·8	40·3	278·0	46·8	5·97
7. N_1 ...	323·5	1·97	294·4	17·8	38·0	264·6	43·6	6·02
8. F.Y.M. ...	329·5	2·02	311·8	18·4	41·4	270·4	47·0	5·92
9. K_2 ...	314·9	1·95	258·7	16·6	34·0	219·4	42·8	6·40
10. Sludge ...	312·6	1·72	245·6	14·4	36·1	216·0	44·7	5·90
11. K_1 ...	301·1	1·70	204·8	12·5	24·9	179·9	40·2	6·10
12. No Manure (Control)	271·2	1·67	187·8	11·4	24·1	163·8	34·9	6·02
P ...	0·01	0·01	0·01	0·01	0·05	0·01	0·01	Large
C.D. ...	21·88	0·31	119·2	6·15	21·5	98·5	16·25	—
S.E.% ...	1·75	4·07	9·83	8·6	17·8	9·4	8·8	5·48

TABLE V.

C. olitorius.

Lay-out :—Replicated randomised blocks in 4 replications, effective plot size 0·002 acre. Sown on 28.4.49. and harvested on 21.9.49.

Treatments.	Yield per acre in mds.	Per cent on control.	Value at Rs. 30/- per md.	Cost of fertilizer per acre.	Cost of cultivation per acre including fertilizer	Net profit per acre.
			Rs.As.	Rs As.	Rs.A.	Rs.As.
1. N_2K_2	36·1	139·0	1083-0	69-6	380-0	702-0
2. Compost	36·0	138·5	1080-0	*	379-0	701-0
3. N_1K_2	35·2	135·9	1059-0	44-6	377-0	682-0
4. N_2K_1	34·2	131·8	1026-0	59-11	371-0	655-0
5. N_2	32·7	125·8	981-0	50-0	364-0	617-0
6. N_1K_1	32·0	123·2	960-0	34-11	361-0	599-0
7. K_2	28·9	111·4	867-0	19-6	348-0	519·0
8. N_1	28·4	109·5	852-0	25-0	345-0	507-0
9. Sludge	27·5	105·9	825-0	*	341-0	484-0
10. K_1	26 7	102·9	801-0	9-11	338-0	463-0
11. No manure	26·0	100·0	780-0	-	334-0	446-0
12. F. Y. M.	24·9	95·8	747-0	37-8	330-0	417-0

P=0·01 ; C. D.=7·41 ; S.E.%=6·47

N_1 = Ammonium Sulphate @1·8 mds. or 30 lbs. of N per acre.

K_1 = Muriate of Potash @ 0·6 mds. or 25 lbs. of K_2 0 per acre.

Compost @150 mds. per acre.

Sludge @150 mds. per acre.

F. Y. M. @150 mds. per acre.

*Compost and Sludge were obtained free from W. B. Agriculture Department ; the cost is not known.

Both N & K increased yield when used alone or in combination. N increased the yield much more than K. Compost, N_2K_1, N_2K_2, N_1K_2 have given much higher yield. Beyond 39% the yield has not increased and there perhaps seems to be a limit to which *olitorius* yield can be increased by manuring. F.Y.M. does not seem to have given any response and in fact has somewhat suppressed the yield.

TABLE VI.

Manurial Trial No. 2 (olitorius).

Average height, base diameter, green weight., etc., of plants in the different treatments. (based on 10 random plants per plot or 40 plants per treatment).

Treatment.	Plant height (cm.)	Base diameter (cm).	Green wt. per plant (gms).	Fibre wt. per plant (gms).	Weight per plant of leaves & branches (non-fibre producing portion (gms).	Weight of clean stem per plant (gms).	Weight of jute stick per plant (gms).	Ratio of fibre, per cent. to green weight of plant.
1. N_2 K_2 ...	402·4	1·0	493·60	24·00	61·30	432·32	87·30	4·86
2. Compost ...	396·0	2·0	523·60	24·00	51·82	471·25	82·30	4·75
3. N_1 K_2 ...	371·0	1·6	338·75	19·67	38·45	300·25	62·47	5·06
4. N_2 K_1 ...	378·0	1·6	350·60	20·05	39·85	310·75	62·87	5·71
5. N_2 ...	384·0	1·7	382·50	21·47	43·25	339·25	69·32	5·61
6. N_1 K_1 ...	363·8	1·5	330·50	18·37	44·75	285·75	58·80	5·55
7. N_2 ...	357·8	1·6	300·75	17·12	35·75	265·00	54·90	5·69
8. N_1 ...	349·8	1·4	242·75	14·12	25·12	217·75	39·43	5·81
9. Slue3d ...	351·0	1·5	297·75	17·82	34·00	263·75	52·47	5·98
10. K_1 ...	326·8	1·4	232·25	13·62	28·75	203·50	48·57	5·86
11. No manure (control) ...	349·4	1·5	261·70	15·62	28·00	232·25	45·48	5·96
12. F. Y. M. ...	350·5	1·5	314·25	16·87	37·62	275·50	53·90	5·36
P =	0·01	0·01	0·01	0·01	0·05	0·01	0·01	
S. E% =	2·90	5·40	11·52	11·38	13·50	12·28	12·81	
C. D. =	41·05	0·33	150·23	8·16	27·16	141·67	29·47	

To compare the yield and quality effects of varying doses of nitrogen from organic and inorganic sources two trials with *C. capsularis* and *C. olitorius* in randomised block layouts were conducted during the season.

The effect of these manures at different levels was studied and the results obtained thereof are given in tables VII & VIII (for *capsularis*) and IX & X (for *olitorius*).

TABLE VII

C. capsularis (D154).

Lay-out:—Replicated randomised blocks in 4 replications, effective plot size = 0·003 acre. Sown on 28.4.49 and harvested on 5.9.49.

Treatments	Yield per acre in md.	Per cent on control.	Value at Rs. 30/- per md. Rs. As.	Cost of fertilizer per acre. Rs. As.	Cost of cultivation per acre including fertilizer Rs. As.	Net profit per acre. Rs. As.
1. C_2 ...	44·9	192·6	1347 0	*	390 0	957 0
2. C_1 ...	41·6	178·5	1248 0	*	376 0	872 0
3. N_3 ...	38·9	166·4	1164 0	48 0	415 0	749 0
4. N_2 ...	33.9	145·5	1017 0	32 0	380 0	637 0
5. F.Y.M_2	33·2	142·5	996 0	75 0	423 0	573 0
6. S_2 ...	31·9	137·1	957 0	*	340 0	617 0
7. N_1 ...	31·8	136·4	954 0	16 0	356 0	598 0
8. F.Y.M_1	28·2	120·9	846 0	37 8	364 8	481 8
9. S_1 ...	26·2	112·3	786 0	*	319 0	467 0
10. No. manure ...	23·3	100·0	699 0	...	307 0	392 0

P = 0·01 ; C. D. = 7·42 ; S. E.% = 5·8 ;
C_1 = Compost @ 150 mds. per acre.
S_1 = Sludge @ 150 mds. per acre.
N_1 = 100 lbs. of Ammonium Sulphate or 20 lbs. of N. per acre.
N_2 = 200 lbs. of Ammonium sulphate or 40 lbs. of N. per acre.
N_3 = 300 lbs. of Ammonium sulphate or 60 lbs. of N. per acre.
F. Y. M_1 = Farm yard manure @ 150 mds. per acre.

CONCLUSIONS.

The yield increased with the increasing doses of Nitrogen from all the sources. Compost was found to give the best results. There were no significant differences in yield between inorganic fertilizer, F.Y.M. and sludge though inorganic fertilizer gave slightly better yield than F.Y.M., which in its turn gave higher yield than sludge. All treatments gave significantly higher yields than No Manure plots, except single doses of F.Y.M. and Sludge.

*Compost and Sludge were obtained free from W.B. Agriculture Department and the cost is not known.

TABLE VIII.

Manurial Trial No. 3 (capsularis).

Average height, base diameter, green weight, etc., of plants in the different treatments. (Based on 10 random plants per plot or 40 plants per treatment)

Treatment.	Plant height (cm.)	Base Diameter (cm.)	Green wt. per plant (gms.)	Fibre wt. per plant (gms.)	Weight per plant of leaves & branches (non-fibre producing) (gms.)	Wt. of clean stem per plant (gms.)	Wt. of jute stick per plant (gms.)	Ratio of fibre, per cent. to green weight.
1. Compost$_2$ ...	359·0	2·55	593·0	31·3	95·1	497·8	7 ·8	5·27
2. Compost$_1$ ...	355·0	2·45	556·8	29·1	95·7	461·1	93·2	5·22
3. N 60lb. ...	322·0	1·92	289·9	16·8	44·4	245 5	48·1	5·79
4. N 40lb. ...	312·1	1·82	269·4	14·7	61·9	207·6	38·4	5·45
5. F.Y.M$_2$ ...	333·7	1·95	314·6	17·1	48·1	266·5	53·0	5·43
6. Sludge$_2$ ...	306·2	1·82	264·9	15·1	42·7	222·2	47·4	5·70
7. N 20lb. ...	315·0	1·80	239·0	13·3	36·3	202·7	38·7	5·56
8. F.Y.M.$_1$ ...	308·4	1·67	206·7	10·9	30·6	176 0	33·7	5·27
9. Sludge$_1$ ...	289·8	1·58	183·0	9·9	36·8	146·2	27·9	5·40
10. No Manure ... (Control)	279·7	1·55	143·1	8·2	19·5	123·0	23·8	5·73
P = ...	0·01	0·01	0·01	0·01	0·01	0·01	0·01	
S.E.% = ...	3·46	4·18	13·97	12·42	26·98	12·52	26·09	
C.D. = ...	43·45	0·31	167·41	8·10	54·00	125·10	28·04	

TABLE IX

C. Olitorius (C.G). Lay-out :—Replicated randomised blocks in 4 replications. Effective plot size = 0·003 acre.
Sown on 22-4-49 and harvested on 14-9-49.

Treatments	Yield per acre in maunds.	Percent on control.	Value at Rs. 30/- per md.	Cost of fertilizer per acre.	Cost of cultivation per acre including cost of fertilizer.	Net profit per acre.
			Rs. As.	Rs. As.	Rs. As.	Rs. As.
1. C_1 ...	33·7	123·9	1011 0	*	349 0	762 0
2. S_2 ...	33·4	122·5	1002 0	*	344 8	658 0
3. N_1 ...	32·0	117·5	960 0	16 0	351 0	609 0
4. N_2 ...	31·9	117·1	957 0	32 0	375 0	582 0
5. C_2 ...	31·9	117·1	957 0	*	349 0	608 0
6. N_3 ...	31·2	114·6	936 0	48 0	391 0	545 0
7. S_1 ...	29·0	106·4	870 0	*	329 8	540 8
8. F.Y.M. $_2$ ...	28·1	103·2	843 0	75 0	392 0	451 0
9. No manure ...	27·2	100·0	816 0	—	313 0	503 0
10. F.Y.M. $_1$ ...	26·9	98·9	807 0	37 8	358 0	556 8

P = 0·01 ; C. D. = 5·78 ; S.E% = 5·1
C_1 = Compost @ 150 mds. per acre.
S_1 = Sludge @ 150 ,, ,,
FYM $_1$ = Farm Yard Manure @ 150 mds. per acre.
N_1 = Ammonium sulphate @ 100 lbs. or 20 lbs. of N per acre.
* Compost and sludge were obtained free from W.B. Agriculture Department and the cost is not known.

The yield increased with increased doses of Nitrogen but only upto a certain limit unlike the D154 crop. Compost proved to be the best. F.Y.M. does not seem to give much increased yield.

It appeared that the yield in *olitorius* could not be increased beyond a certain limit.

TABLE X.

Manurial Trial No. 4 (olitorius)

Average height, base diameter, green weight, etc. of plants in the different treatments. (Based on 10 random plants per plot or 40 plants per treatment).

Treatment	Plant height (cm.)	Base diameter (cm.)	Green wt. per plant (gms.)	Fibre wt. per plant (gms.)	Weight per plant of leaves & branches (non-fibre producing) (gms.)	Wt. of clean stem per plant (gms.)	Wt. of jute stick per plant (gms.)	Ratio of fibre, percent. to green weight.
1. Compost$_1$ ...	377·30	1·67	342·93	19·0	47·85	306·92	73·02	5·54
2. Sludge$_2$ ...	372·40	1·55	288·10	16·6	34·62	260·40	50·47	5·66
3. N$_1$ ...	357·20	1·45	253·55	15·7	31·05	222·50	48·95	6·19
4. N$_2$ ...	371·60	1·52	290·50	17·2	38·32	260·20	56·02	5·92
5. Compost$_2$ ...	392·50	1·92	451·62	21·8	60·70	426·57	79·55	4·82
6. N$_3$ ...	381·50	1·62	341·85	19·5	44·05	272·80	66·75	5·70
7. S$_1$ ...	361·20	1·42	280·30	16·1	37·85	242·45	52·87	5·74
8. F.Y.M.$_2$ ...	334·50	1·42	228·72	13·5	28·92	199·80	42·12	5·90
9. No manure ...	327·50	1·37	202·22	12·8	26·90	178·12	42·35	6·32
10. F.Y.M.$_1$ ...	326·60	1·30	199·47	10·2	26·42	173·05	35·00	5·11
P =	0·01	0·01	0·01	0·01	0·01	0·01	0·05	
S.E.% =	2·65	1·04	12·86	11·48	15·88	13·05	15·97	
C.D. =	37·34	0·37	145·02	7·3	23·44	131·26	34·22	

TRIPLE CROPPING

To study the possibilities of growing three crops on a land, in the same year under Chinsurah conditions, with jute as the first crop, two experiments were conducted, one with *olitorius* and the other with *capsularis* jute.

I. TRIPLE-CROPPING WITH OLITORIUS :

The treatments included two varieties (Chinsurah Green and O39-620), three stages of harvest of jute crop *i.e.* before bud, bud stage and flower stage. Paddy followed as the second crop which was transplanted seven days after each stage of harvest of jute crop. The seeds of berseem which was scheduled to be grown as the third crop was only available in January, 1950 when the soil was very dry and hard and was not grown. The experiment, therefore, can be considered as double-cropping with jute instead of triple-cropping. The yields of jute crop was rather low as the crop was sown in a slightly low land and also due to incessant rains at the early stages of crop growth.

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The data on yield, cost of cultivation and profit from jute and paddy are given in Table XI.

TABLE XI.

Yield, cost of cultivation and profit in triple-cropping with olitorius jute.

LAY-OUT :—*Replicated randomised blocks in 6 replications, effective plot size = 0·012 acre.*

Date of sowing of jute = 24-4-49. *Dates of transplanting paddy = 3-8-49., 18-8-49., and 27-8-49.*

Treatment.	Jute yield per acre (md.)	Value of Jute @ Rs. 30 per md.	Cost of cultivation of jute per acre	Net profit of jute per acre	Yield of paddy per acre (md).	Value of paddy @ Rs. 10 per md.	Yield of straw per acre. md.	Value of straw @ Rs. 3 per md.	Cost of cultivation of paddy per acre	Net profit from paddy per acre	Net profit per acre from jute and paddy
		Rs. As.	Rs. As.	Rs. As.		Rs. As.		Rs. As.	Rs. As.	Rs. As.	Rs. As.
Before bud stage (C.G.)	13·6	408 0	242 8	155 8	25·0	250 0	32·2	97 14	185 0	162 14	318 6
Bud stage (C. G.) ...	15·3	459 0	252 12	206 4	22·7	227 0	25·2	76 14	180 0	123 14	330 2
Flower stage (C.G.) ...	17·1	513 0	259 0	254 0	20·0	200 0	23·4	67 10	175 0	92 10	346 10
Before bud Stage (O39-620) ...	14·6	438 0	248 8	189 8	24·8	248 0	28·0	84 0	184 8	143 8	333 0
Bud stage (O39-620)...	16·9	507 0	258 8	248 8	23·1	231 0	27 2	82 14	182 0	131 14	380 6
Flower stage (O39-620)	18·8	564 0	270 0	294 0	20·0	200 0	23·0	69 0	175 0	94 0	388 0

II. TRIPLE CROPPING WITH CAPSULARIS :

The treatments included two varieties of *capsularis* jute, one early (Fanduk) and the other late (D154) with three stages of harvest *i.e.* before bud, bud and flower stages followed by paddy. The mustard as the third crop after paddy could not be grown as the land was very dry and hard and could not be ploughed after the harvest of paddy. This experiment was put in a very low land where all the rain water accumulated in the early stages and the land practically remained water-logged throughout the whole jute season. The pest and disease attacks were also severe. This resulted in a very stunted growth of jute crop which reflected in the very poor yields of fibre obtained.

The data on yields, cost of cultivation and profit from jute and paddy are given in table XII.

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TABLE XII.

Yield, cost of cultivation and profit in triple-cropping in capsularis jute.

Lay-out :—Replicated randomized blocks in 6 replications, effective plot size = 0·012 acre.

Date of sowing of jute = 16-4-49. Dates of transplanting paddy = 3-8-49, 18-8-49 and 28-8-49.

Treatment.	Jute yields per acre.	Value @ Rs. 30/- per md.	Cost of cultivation of jute.	Net profit from jute.	Paddy yield.		Value of grain @ Rs. 10/- per md.	Value of straw @ Rs. 3/- per md.	Cost of cultivation of paddy.	Net profit from paddy.	Total profit from jute and paddy.
					Grain in mds.	Straw in mds.					
		Rs. As.	Rs. As.	Rs. As.			Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
Before bud stage (Fanduk) ...	5·5	165 0	190 0	+25 0	19·85	25·87	199 0	77 0	110 0	166 0	141 0
Bud stage (Fanduk)	6·3	189 0	195 0	− 6 0	19·03	22·59	190 0	68 0	108 0	150 0	144 0
Flower stage (Fanduk) ...	7·9	237 0	200 0	+37 0	15·57	18·40	156 0	55 0	99 0	112 0	149 0
Before bud stage (D154) ...	6·0	180 0	195 0	−15 0	23·40	27·00	234 0	81 0	116 0	199 0	184 0
Bud stage (D154) ...	6·5	195 0	195 0	Nil.	22·58	25·69	226 0	77 0	112 0	191 0	171 0
Flower stage (D154)	8·8	264 0	204 0	+60 0	18·39	24·2	184 0	73 14	106 0	151 14	211 14

It will be seen from the data in both the trials that higher yields of jute fibre were obtained from later stages of harvest. Returns (money value) were also maximum in the jute harvested at later stage.

It may be noted that the treatments of jute or paddy alone were not included in the experiments and as such, it is not possible to compare the merits of double cropping with jute as against single crops of jute or paddy. These treatments will be included in next year's trials. Soil exhaustion, if any, also could not be studied for lack of facilities for chemical examinations of both soil and plant at various stages during the year under report.

Treatments of early and late varieties of paddy following jute will be included in future experiments. It may be concluded that double-cropping with jute and paddy is possible and is likely to result in a much greater profit in a normal year. For the third crop, crops like 'khesari' and 'kalai' are recommended. These crops do not require much land preparation and can be sown in the standing paddy crop when moisture conditions are good thus enabling them to establish themselves before the soil becomes too dry. Crops like berseem and mustard etc. cannot be grown under Chinsurah conditions unless irrigation facilities are available.

Double cropping in low lands with jute as the first crop.— To study the possibilities of growing jute as an earlier additional crop in the low lands that are usually single cropped lands growing only paddy, an experiment was conducted with an early (Fanduk) and a late (D154) variety of jute. During the year under report there were unusual early heavy rains causing flooding of all low lands and the jute crop was totally submerged at the very early stage (15 days old crop) and the whole crop was lost. In years of very early rains it is not possible to grow jute as an additional crop before paddy unless the jute crop can be sown earlier with the help of irrigation. In normal years, however, it is possible to grow jute and paddy and the experiment will be conducted again next year.

Yield and quality of fibre at different stages of maturity.— To study the effects of various stages of harvest on yield and quality, an experiment with *capsularis* jute (variety D154) was conducted.

The treatments included harvests at (*a*) well before bud stage, (*b*) just before bud stage, (*c*) bud stage, (*d*) 50% flower stage, (*e*) early pod stage, (*f*) pod stage, (*g*) mature pod stage and (*h*) usual small pod stage (control).

The data on yield, dates of harvest, steeping and extraction are shown below in Table XIII. The results of the technological tests of the fibre samples are awaited.

TABLE XIII

Lay-out :—Replicated randomized layout in 6 replications. Effective plot size 0·004 acre. Sown on 15-4-49.

Treatments.	Yield per acre in pounds.	Percent on control.	Date of harvest.	Age of crop at harvest.	No. of days required for retting.
1. Well before bud stage ...	636·6	41·9	7-7-49	83 days	8
2. Just before bud stage ...	932·7	61·5	20-7-49	96 ,,	10
3. Bud stage ...	1105·1	72·2	2-8-49	109 ,,	10
4. 50% flower stage.	1397·1	92·9	22-8-49	129 ,,	14
5. Early pod stage.	1437·0	94·8	6-9-49	144 ,,	21
6. Pod stage ...	1487·1	98·1	23-9-49	161 ,,	21
7. Mature pod stage ...	1588·5	104·8	4-10-49	172 ,,	20
8. Usual small pod stage (control).	1515·9	100·00	19-9-49	157 ,,	20

P=0·01 ; C. D.=6·26 ; S. E%=5·36.

Yield increased with advance in stage of harvest. Harvests earlier than 50% flower stage does not seem to be economical. Retting in the earlier months took much less time than in later months. This apparently is due to higher temperatures of retting water during the earlier months.

Date of sowing in jute.—To study the effects of dates of sowing under Chinsurah conditions on plant growth, flowering, yield and incidence of disease and pest, two experiments, one with *capsularis* and the other with *olitorius* jute were conducted. The treatments included eight dates of sowings at intervals of 15 days, commencing from 16th March, 1949. Harvests were done at the usual pod stage. The plant height, base diameter, flowering and harvest dates and yield of fibre per acre are given below in Table XIV.

TABLE XIV.

Capsularis (*Variety D154*)

Treatments (Dates of sowing)	Plant height in cm.	Base diameter in cm	1st flowering date	Harvest date	Yield per acre in mds.	Percent on control
1. 16-3-49 ...	124·9	1·4	4-8-49.	8-9-49.	23·76	100·00
2. 1-4-49 ...	121·3	1·4	27-8-49.	26-9-49.	18·38	142·41
3. 16-4-49 ...	140·5	1·5	31-8-49.	5-10-49.	17·20	133·25
4. 1-5-49 ...	138·6	1·5	5-9-49.	7-10-49.	18·02	139·64
5. 16-5-49 ...	158·9	1·6	25-8-49.	7-10-49.	14·11	109·30
6 1-6-49 ...	118·3	1·1	28-8-49.	25-10-49.	5·35	41·42
7. 16-6-49 ...	110·0	0·9	8-9-49.	25-10-49.	2·88	22·30
8. 1-7-49 ...	76·1	0·7	7-9-9.	25-10-49.	1·43	11·08

Olitorius (*Variety C. G.*)

Treatments (Dates of sowing)	Plant height in cm	Base diameter in cm.	Date of 1st flowering	Date of harvest	Yield in mds per acre	Percent on control
1. 16-3-49 ...	43·81	0·90	19-4-49	4-7-49	7·89	100·00
2. 1-4-49 ...	224·70	1·16	1-9-49	7-9-49	19·21	243·47
3. 16-4-49 ...	261·70	1·53	12-7-49	8-11-49	25·43	322·22
4. 1-5-49 ...	231·80	1·40	5-9-49	8-11-49	17·18	217·69
5. 16-5-49 ...	270·30	1·40	21-8-49	9-11-49	14·77	159·33
6. 1-6-49 ...	189·20	0·96	20-8-49	9-11-49	7·51	81·01
7. 16-6-49 ...	14·50	0·81	29-8-49	10-11-49	3·60	38·83
8. 1-7-49 ...	67·40	0·58	8-9-49	11-11-49	2·03	21·90

In *capsularis*, earlier sowings gave higher yields. The two earliest sowings, however, required irrigation. Later sowings in June and July gave very poor yields and were definitely uneconomical. Under Chinsurah conditions sowings for *capsularis* jute should be completed between middle of April to beginning of May. Earlier or later sowings than above did not seem to be either possible or resulted in very poor yields.

In *olitorius*, the two earliest sowings had to be irrigated. Unlike in *capsularis*, March sowings of *olitorius* jute proved a failure. The earliest sown plants soon branched profusely, flowered and became stunted resulting in very poor yields. In our general experience with jute elsewhere, *olitorius* unlike *capsularis* have been found not to be able to stand drought conditions and if sown early, always results in branching, flowering and stunted growth. Sowings later than middle of May did not seem to grow well.

Inter-culture in jute (in broadcast crop).—To study the effects on yield, quality and cost of production of different frequency and number of times of intercultural operations in jute two experiments, one with *capsularis* (D154) and one with *olitorius* (Chinsurah Green) jute, were conducted, in replicated randomised block lay-out during the year. The treatments included :—

(*a*) Only one weeding & thinning at early stage (20 days old crop).

(*b*) Only one weeding & thinning at late stage ($1\frac{1}{2}$ months old crop).

(*c*) 2 weedings and thinnings at early stage (20 days old) and one at late stage (45 days old).

(*d*) 3 weedings and thinnings (20 days, 35 days, and 50 days).

(*e*) 4 weedings & thinnings (15 days, 30 days, 45 days and 60 days).

An unfortunately abnormal and heavy rains especially at the earlier stages interfered very much with proper and timely intercultural operations as scheduled this year which was far from normal.

The results, however, indicated that more frequent interculture gave better yields, and that when number of weedings and thinnings remaining same, earlier operations gave better results.

Interculture in jute (*in line grown crop*).—To study the effects on yield and quality from frequency and number of times of intercultural operations in line sown jute crop, 2 trials, one with *capsularis* (D154) and one with *olitorius* (Chinsurah Green) jute, were conducted in replicated randomised block lay-out during the year at Chinsurah Farm. The treatments included :—

(1) One hand weeding & 2 subsequent operations of wheel hoeing at different dates.

(2) One hand weeding & 4 subsequent operations of wheel hoeing at different dates.

(3) No hand weeding but 3 operations of wheel hoeing at different dates.

(4) No hand weeding but 4 operations of wheel hoeing at different dates.

(5) No hand weeding but 5 operations of wheel hoeing at different dates.

(6) No hand weeding but 6 operations of wheel hoeing at different dates.

(7) Two hand weedings alone.

(8) Three hand weedings alone.

Abnormal and continuous heavy rains especially at the earlier stages interfered very much with proper and timely intercultural operations. From the study of available data no significant differences between different treatments were noticeable.

SOIL AND BIOCHEMICAL STUDIES.

The work of the Chemical Section could not be taken up last year in the beginning of the jute season owing to the lack of laboratory facilities at Hooghly. Some work, however, was previously done in the chemical laboratory of the Presidency College, Calcutta, but no conclusion could be drawn from the insufficient data available. No time was lost to fit the laboratories at Hooghly, but due to the non-availability of a gas plant work was delayed. A portable aerogen gas plant with a capacity of twenty burners was fitted and a storage tank was installed to supply water to the whole of the Institute. The complete fitting of the chemical laboratory took about five months and as the jute season was almost over chemical problems on jute could not be taken up and only microbiological studies on the retting of jute were done. Later a few soil samples including those from the proposed Krishnagar and Barrackpore sites of our institute were analysed.

Retting of Jute.—Studies on the retting of Jute were taken up with the beginning of the retting season. This work may be broadly classified into two categories:

A. Effect of various substances on the retting of jute with a view to shorten the retting period.

Jute plants usually take about three weeks to ret completely. In order to shorten the period of retting, jute was retted along with sunn hemp, paddy straw and fermenting fruits of *Putranjiva Roxburghii* Wall in the laboratory. Jute stems together with different proportions of Sunn hemp were retted separately. Putranjiva fruits were allowed to ferment for 24 hours, and then the fermenting fruits were mixed with the jute stem which were then retted. In case of straw, the stems were packed with it (loosely and tightly) and then retted separately. All these were found to shorten the retting period. Ammonium salts were also found to reduce retting periods considerably. These studies will be repeated both on a laboratory scale and under field conditions to confirm the results and efforts will be made to find out the actual causes of shortening the period.

B. *Microbiological Studies.*

The retting water from the different retting pits was gathered at different periods of retting and routine work of isolating different strains of micro-organisms in the pure state were carried out. Tube cultures were made from the retting water and repeatedly planted in solid media in petridishes and subcultured again in liquid medium, till only one set of colonies was visible in the single plate. The isolated pure strains were then studied for their activities in retting jute. About half a dozen aerobic strains were isolated of which three have been found to be capable of retting jute under asceptic conditions. The identification of these isolated strains and also studies of the effect of different nutrients on their activities, were in progress. Attempts for isolation of newer strains of bacteria both aerobic and anaerobic were also continued.

DISEASES.

I. Study of the Effect of Environmental Factors on Secondary Infection of Stem-Rot:

From the 'Date of sowing' experiment, it was found that leaf-infection due to *Macrophomina phaseoli* increases after showers, provided the relative humidity continues to remain high (95-100) and the maximum temperature remains above 90 or so for about 24 hours after the showers.

Such combination of factors as stated above often occur in the months of May, June, and July. Older crops are better fitted to resist infection in such critical days favourable for leaf infection. 15 days old crop has been found to be more susceptible on such days than older plants.

Hence early sowing helps the crop to tide over the chances of infection.

It is recommended, that whenever other conditions permit, sowings should be taken up with the early nor-wester showers.

II. STUDY OF THE STEM ROT FUNGUS :

(*i*) *Inoculation experiments with Macrophomina phaseoli.*—Attempts to create artificial epidemic condition with sclerotial inoculation of soil, often failed due to unknown causes. In order to ascertain the conditions for germination of sclerotia produced in artificial cultures, and conditions required for their pathogenicity, a series of laboratory experiments were started. Of the series the first was to find out the media in which optimum germination is possible.

Sclerotia, produced in artificial culture, germinate in tap water, sugar solution or ammonium sulphate solution at 32.5°C. Germination is slightly more in Dextrose solution than in others. Further work is in progress.

(*ii*) *Study of the cultural characteristics.*—With the ultimate object of studying physiological strains of *Macrophomina phaseoli*, cultural studies under laboratory conditions were started. 21 isolations of the fungus from different sources have been collected and are being maintained.

III. STUDY OF PATHOGENS OTHER THAN MACROPHOMINA PHASEOLI :

(*i*) *Sclerotium rolfsi.*—The perfect stage of *Sclerotium rolfsi* causing 'soft-rot' in jute was so far not found on the same host. In the month of August, 1949, one plant (*C. Olitorius*, type 0-39-753) having soft-rot attack showed some deviation from the normal symptoms. Instead of the usual cob-webby, spreading, white mycelial strands, a felty white crust associated with sclerotia was seen. This crust on examination was found to have basidia with 4 sterigmata and basidiospores which were slightly concave on one side.

The fungus was isolated; but it did not produce basidia in pure culture. Antagonism of certain fungi isolated from soil were being studied against *Sclerotium rolfsi*. In this study in one treatment an *Aspergillus sp* and a *Mucor sp* were grown in the same dish with *Sclerotium rolfsi* which produced white, encrusted, mycelial mat at the periphery of the petridish. The

mat on examination was found to have produced basidia and basidiospores exactly of the same description as was found in nature.

(*ii*) *Chlorosis*.—The nature and causes of chlorisis in jute are still unknown. It, however, does not seem to seriously affect the crop and its yield. It has been thought that it is either due to virus or due to some complex genetic defect. It has also been found to respond to chemical stimulus. The important observations made during this season were that the symptoms appeared as early as in the cotyledonary stage. It may, however, appear later. Symptoms of chlorosis may disappear at any stage of growth or persist until seed production.

100 chlorotic plants were kept under observation, records on which were taken at intervals of 30 days. On the final day of observation 60 were found free of all chlorotic symptoms, 35 were showing symptoms of various degrees; 5 were killed by fungal diseases or insect pests.

From the general record of the entire cropped area of the farm in 1949, approximately 1 in every 3000 plants was found to be chlorotic.

Grafting of chlorotic and non-chlorotic individuals (of the same variety) yielded interesting results. With chlorotic 'scion' and non-chlorotic 'stalk', chlorosis was induced in 11 cases out of 20. In 2 cases where the 'stalk' was chlorotic and scion' was non-chloritic there was no induction of chlorosis.

Out of 27 inarchings between chlorotic and non-chlorotic plants there were no induction of chlorosis in the non-chlorotic ones until one of the two was severed of its connection with soil.

In 5 cases where the non-chlorotic plant was severed there was induction of chlorosis in the remaining upper part. In 2 cases where the chlorotic plant was severed there were mild symptoms of chlorosis developed in the non-chlorotic counterpart.

In 15 other cases even after severing one or the other, chlorosis was not induced.

IV. CONTROL MEASURES :

(*i*) *Selection of stem-rot resistant types* :—174 plants were selected in 1948 from a heterozygous population from multiple crossing materials of 8 known *C. capsularis* cultivated types having desirable characters for yield and quality. Of these 153 selections were tested in 3 replicated trials. The field in which these trials were conducted had no record of diseases, in previous years. Hence artificial inoculations were given from time to time in suitable days with sclerotia during tillage and pycnospores in the post-sowing stages. Morphological characters and the number of stem-rot attack, in each progeny group have been recorded.

Out of the 153 selections, 52 have been brought forward for trials in 1950; these includes susceptible types as well as resistant ones.

Preliminary selections for disease resistance were also made from the improved recommended strains of the Jute Agricultural Research Institute. Of these 60 were from *C. capasularis* and 22 from *C. olitorius*. Performances of these selections will be studied in 1950-51.

(*ii*) *Seed treatment and storage*.—In our previous investigations it was found that retention of viability of jute seeds chiefly depended on the moisture content of the seed as well as storage conditions.

Further studies on storage conditions showed that air-tight dry containers are best for storage. In 1948, 4 different kinds of containers were chosen for storing seeds *viz.* gunny bags, galvanized iron-sheet bins, glass bottles with stoppers and earthen pots with lids. The seeds grown at Chinsurah Farm harvested in December 1948, were stored at Hooghly, in the Institute godown. The results are tables below :—

TABLE—XV.

Data showing record of germination and disease in stored seeds.

Particulars regarding condition of storage.	C. capsularis : D 154							C. olitorius : Chinsurah Green						
	Dates of observation.						Remarks.	Dates of observation						Remarks
	25-7-49		10-12-49		29-5-50			25-7-49		10-12-49		29-5-50		
	G. P.	D.P.	G.P.	D.P.	G.P.	D.P.		G.P.	D.P.	G. P.	D.P.	G.P.	D.P.	
1. Treated, in gunny bag, in contact with floor. ...	89·1	0·0	*				*Lost viability	93·5	1·0	2·5	0·3	*		*Lost viability
2. Treated, in gunny bag, on bamboo platform 10" above the floor. ...	90·2	0·7	*				*Lost viability	93·7	0·5					*Lost viability
3. Treated, in seed-bins, in contact with floor. ...	93·2	0·6	93·1	0·5	84·9	0·0		97·7	0·0	97·5	0·0	92·4	0·0	
4. Treated, in earthen pots, in contact with floor. ...	85·8	1·4	*				*Lost viability	90·4	0·2	0·5	0·7	*		*Lost viability
5. Treated, in earthen pots, exposed to sun, twice in two months. ...	86·7	1·4	*				*Lost viability	91·4	0·5	1·6	0·5	*		*Lost viability
6. Treated, in glass bottles.	91·7	0·1	90·6	0·4	90·6	0·0		96·2	1·1	96·6	0·9	90·9	0·0	
7. Treated, in glass bottles, exposed to sun twice in two months. ...	90·1	0·0	92·0	0·0	90·2	0 0		97·9	0·2	95·2	0·4	93·4	0·0	
8. Untreated, in bottles ...	88·5	6·7	87·9	4·8	87·5	0·0		95·4	2·7	95·0	1·3	94·0	0·0	
9. Untreated, in bottles, exposed to sun, occasionally. ...	88·5	6·7	87·2	4·9	87·5	0 0		96·5	3·9	96·0	1·0	95·5	0·0	

'Treated' indicates treatment with Agrosan GN (1%), before storing.

N.B.—Prior to storing, all seeds were dried in sun for 4 days.

G.P. = Germination percentage. D.P. = Disease percentage.

From the above table and general observations it was found that—

(1) glass bottles and seed-bins were best for storing seeds.

(2) seeds tend to lose viability very rapidly when stored in gunny bags or earthen pots kept on damp floors.

(3) treated seeds can be stored for long period, although it retards germination to a certain extent.

(4) treated seeds lose viability more rapidly than untreated ones when exposed to damp conditions.

(5) under same conditions olitorius seeds remain more viable than capsularis seeds.

(iii) Chemical sprays to control infection by Pycnospores.— A replicated field trial was conducted with perenox (2 per cent), Lime Sulphur (2 per cent), Copper lime (16 per cent) copper, 5 per cent sol) and a control having 'no spray' as treatments. Starting from 5th June 4 sprays were applied until 9th July 1949 on suitable dates. Routine counts, however, did not show any infection even in control plots. Attempts to create artificial infection did not prove successful.

(iv) Relative efficacy of 'Agrosan GN' and 'Landesan.— In order to asses the relative efficiency of the two commercial seed dressing dusts in checking seedling blight, a small replicated field trial was conducted with diseased capsularis seeds.

Contrary to expectation there were no seedling blight even in the untreated plots. Hence a comparison of treated and untreated plots were not possible. The stand in all the plots was normal. It was observed that in treated plots, both in case of Agrosan GN and Landesan, the hypocotyl was stouter and the cotyledonary leaves larger and more green than those in the untreated plots.

Prior to the field trial a laboratory test was conducted with the same seed. The test was conducted in petridishes at 32.5°C.

TABLE XVI.

Showing relative efficacy of Landesan and Agrosan GN.

Treatment.	Mean G.P.	Per cent diseased.	Average length of radicle in 48 hours.
Landesan	62.5	0	2.2
Agrosan GN	64.0	0	1.2
Untreated	51.0	13.7	2.8

Both 'Landesan' and 'Agrosan GN' were efficient in fungicidal action, so far as the seed-borne fungi of jute are concerned. Treatment with the said dusts tends to affect the growth of the seedling in the initial stages; the axis becomes short but stouter and the cotyledonary leaves becomes larger and more green.

PESTS.

During the season *Hemitarsonemus latus* (mite) spread out in an epidemic form all over West Bengal. Incidences of *Anomis sabulifera* and *Diacrisia obliqua* were much less in comparison and were localised. The pests were controlled in the farm and in the districts by applications of suitable insecticides. Insecticidal sprays were also given in the farm to prevent oviposition by *Apion corchori*.

Plant protection training was imparted to the Field Assistants of the Jute Development Scheme. Demonstrations on jute pests and methods of their control were also given in Bihar and in West Bengal in connection with the "Grow More Jute" campaign.

Relative resistance of capsularis and olitorius to Apion corchori.—Under Dacca conditions, *Capsularis*, in general was found to be more susceptible to Apion damage than *Olitorius*. To verify this under Chinsurah conditions a paired-plot trial with C39-212 (*Capsularis*) and O40-632 (*Olitorius*) was carried out. The data are given in Table XVII.

TABLE XVII

Extent and intensity of Apion attack in jute.

Effective plot size=0·007 acre. *Sown on 24-4-49.*

Age of the crop in weeks	Number of plants attacked (in mean %)		P	Number of attack per plant (in mean%)		P
	Capsularis	*Olitorius*		*Capsularis*	*Olitorius*	
	C 39-212	O 40-632		C 39-212	O 40-632	
2	0·70	0·39	Large	0·01*	0·00	0·05
3	2·36	2·30	Large	0·02	0·02	Large
4	5·59	4·25	Large	0·06**	0·04	0·01
5	6·04	4·34	Large	0·06	0·05	Large
6	10·01	9·57	Large	0·12	0 11	Large
7	18·34*	12·86	0·05	0·27*	0·17	0·05
8	38·12	30·92	Large	0·58	0·45	Large
9	32·69	27·87	Large	0·64	0·55	Large
10	42·20	43·30	Large	1·12	0.95	Large
11	47·51	48·08	Large	1·23	1·16	Large
12	45·04	49·73	Large	1·68	2·07	Large
13	36·40	42·20	Large	1·23	1·71**	0·01
14	41·30	51·25*	0·05	1·42	2·17**	0·01
15	42·13	50·99	Large	1·31	2.02**	0·01
16	47·35	60·01**	0·01	1·57	2·40**	0·01
17	63·41	70·02	Large	1·71	2·46**	0·01

*Significant at 5% level
**Significant at 1% level

The results indicate that the amount of attack is higher in *Capsularis* during the early crop season. The incidence, however, increases both in intensity and extent in *Olitorius* at later stages resulting in significantly higher total attacks in *Olitorius* than in *Capsularis*.

The incidence of Apion attack in *Capsularis* (D154) and *Olitorius* (C.G.) from the "Date of sowing" experiments also corroborates the above observation.

Effect of Gammexane on Apion oviposition :—On the basis of observation in the laboratory, a randomised replicated field trial was undertaken to determine the effect of Gammexane (D.025) on Apion oviposition.

Treatments—(A) dusting of Gammexane at intervals of 7 days @ 5 lbs. per acre; (B) dusting of Gammexane at intervals of 14 days @ 10 lbs. per acre; (C) dusting of Gammexane at intervals of 28 days @ 25 lbs. per acre; (D) Gammexane @ 10 lbs. per acre in bags replaced at interval of 14 days; one bag per 20 sq. ft. (each bag containing 2.0 gms); (E) Gammexane @ 25 lbs. per acre in bags replaced at equal interval of 28 days; one bag per 20 sq. ft. (each bag containing 4.9 gms); (F) Control without any treatment. 1st application of Gammexane was 16 days after sowing.

None of the treated plots, showed any significant difference against control plots. This, apparently, is due to the indirect insect control effect of the insecticide on the control plots which were very close to the treated plots in the same layout. Mean oviposition percent, for the trial as a whole, was, however, much less than in the other trial with the same type of crop and with same dates of sowings which received no insecticidal treatments. This indicates that there has been some control in Apion oviposition by Gammexane.

Effect of different dates of sowing on the incidence of major pests in jute:—Sowings in the two date of sowing experiments, one with *Capsularis* and another with *Olitorius*, were done at intervals of 15 days starting from 16th March. Periodical records were kept on the extent of attack by *Laphygma exigua*, *Apion corchori*, *Anomis sabulifera* and *Hemitersonemus latus* on crops (D154 & C.G.) sown on different dates.

Table XVIII shows that early sown treatments A & B suffer most from *Laphygma exigua* while later sowing escape the attack to some extent. Treatments C & D sown on 16th April and 1st May respectively had significantly less attacks from *Laphygma* damage with no adverse effect on yield.

TABLE XVIII

Extent of attack by Laphygma exigua in mean % Effective plot size. 0·0024 acre

Treatments (Date of sowing)	*Capsularis* (D154)				*Olitorius* (C. G.)			
	15 days old	one month old	two months old	Mean yield per treatment in lb.	15 days old	one month old	two months old	Mean yield per treatment in lbs.
A-16-3-49	0·00	4·77	6·99	2·53	0·06	9·46	0·46	1·55
B- 1-4-49	0·00	10·29	0·00	3·63	0·00	14·45	0·00	3·76
C-16-4-49	0·09	2·93	0·00	3·37	0·00	1·16	0·00	4·98
D- 1-5-49	0·00	0·15	0·00	3·53	0·00	1·05	0·00	3·36
E-16-5-49	0·08	0·25	0·00	2·76	0 00	0·72	0·00	2·89
F- 1-6-49	3·54	0·44	0 00	1·05	1·16	0·23	0·00	1·47
G-16-6-49	0·00	0·00	0·00	0·56	0·00	0·18	0·00	0·71
H- 1-7-49	0·00	0·00	0 00	0·28	0·00	0·00	0·00	0·40
C. D.	1·96	3·82	...	0·19	0·50	2·46	...	0·75

From table XIX it may be seen that Apion attack is much less in late sown (June, July) crop but such late sowings, gave very poor and uneconomic fibre yields. Incidence of *Anomis sabulifera* was, however, heavy on late sown crop, (Table XX); while early crops are more susceptible to *Hemitarsonemus latus* (Table XXI).

TABLE XIX

Extent of Apion attack in mean %

* Treatments (Date of sowing)	*Capsularis* (D154)					*Olitorius* (C. G.)				
	Age of the crops (days)									
	15 days	30 days	60 days	90 days	120 days	15 days	30 days	60 days	90 days	120 days
A—16-3-49 ...	0·07	5·19	46·68	47·60	0·46	0·00	0·68	6·39	79·96	Already harvested
B— 1-4-49 ...	0·00	6·21	61·61	26·46	1·93	0·00	1·49	21·63	69·77	4·36
C—16-4-49 ...	0·00	11·06	43·82	27 74	0·00	0·00	6·02	14·79	54·71	10·40
D— 1-5-49 ...	0·00	31·46	36·00	14·44	0·00	0·00	4·54	47·02	37·87	0·00
E—16-5-49 ...	0·00	45·97	3·41	2·95	10·68	0·00	6·68	26·57	2·53	21·73
F— 1-6-49 ...	0·54	9·48	12·14	0·86	2·40	0·10	5·02	26·11	1·73	2·48
G—16-6-49 ...	0·00	1·02	9·02	9·90	4·81	0·00	1·42	7·26	3·34	1·76
H— 1-7-49 ...	0 00	2·37	1·76	0·59	already harvested	0·00	2·99	4·43	0·70	already harvested
C.D. ...	0·39	8·49	22·30	17·12	7·89		3·54	15·21	12 67	11·20

*Treatments and yield as in Table XVIII

TABLE XX

Extent of attack by Anomis sabulifera in mean %

*Treatments	D 154				C. G.			
	1 month old crop	2 months old crop	3 months old crop	4 months old crop	1 month old crop	2 months old crop	3 months old crop	4 months old crop
A—16-3-49	0·00	6·51	5·04	6·28	0·00	0·00	5·42	...
B— 1-4-49	0·00	0·00	5·62	18·27	0·00	0·00	1·21	13·72
C—16-4-49	0·00	3·41	13·42	20·65	0·00	5·43	0·00	20·35
D— 1-5-49	0·30	7·69	17·05	18·69	0·05	4·48	12·22	16·58
E— 16-5-49	0·81	29·16	34·50	4·23	8·10	21·24	17·78	20·81
F— 1-6-49	0·24	25·79	14·35	1·54	7·60	35·38	21·13	7·46
G—16-6-49	3·37	23·84	12·89	14·90	8·88	13·99	17·01	13·33
H— 1-7-49	0·73	12·47	2·20	...	3·24	5·45	13·09	...
C. D.	2·12	12·12	8·94	12·13	3·98	14·90	10·58	8·75

*Treatments and yield as in Table XVIII.

TABLE XXI.

Extent of attack by Hemitarsonemus latus in mean %

*Treatments.	D 154				C.G.			
	One month old	2 months old	3 months old	4 months old	1 month old	2 months old	3 months old	4 months old
A	0·00	0·00	23·72	15·65	0·00	0·00	21·98	...
B	0·00	0·00	27·22	14·13	0·00	25·03	26·25	14 13
C	0·00	3·63	27·44	14·42	0·00	27·62	62·41	26·61
D	0·00	1·76	5·06	12·66	0·00	20·98	24·74	6·50
E	0·00	6·18	13·61	0·00	0·13	31·41	17·64	0·00
F	0·00	0·87	7·60	1·88	0·00	18·87	6·08	0·00
G	0·00	2·47	0·00	0·00	0·00	9·44	0·00	0·00
H	0·00	0·16	2·25	...	2·70	10·21	0·00	...
C.D.	...	...	17·31	9·79	...	16·10	21·17	7·56

*Treatments and yield as in Table XVIII.

Selection for Apion resistance.—81 single plant selections were made for study of the performances of their progenies against *Apion corchori.*

NEW RECORDS:—

Cerambycid borer (To be identified).—The pest has been recorded from *Olitorius* jute. No incidence has yet been noted on any *Capsularis* jute. Females during oviposition cut the cortex of the stem at two points making two circular rings about 1 cm. apart all round the stem and thrust the egg in the pith of the stem between the two rings.

Such attack causes death of the apical region of the plant above the rings. The pest hybernates during winter as grub. Indications point out that the pest may turn out to be one of the major pests for *Olitorius* jute in course of time.

THE PEST & DISEASE CONTROL SCHEME: TARAKESWAR

The efficacy and efficiency of various control measures evolved at the Jute Agricultural Research Institute on the basis of laboratory experiments and small field trials cannot be straight away recommended for the cultivator unless (1) they are tried on a large scale under farmers' conditions and (2) their economics studied properly. With this end in view a scheme on 'Pest & Disease Control' on pilot plant scale was drawn up somewhat similar to that which existed at Narsingdi, (while the Institute was at Dacca) and the work was started in the end of 1949.

An area of 200 acres of cultivators' jute land has been brought within the scope of our intensive study. Our recommended control measures are being tried in these fields and the results and economics thereof are being recorded.

SUBSTITUTE FIBRE SECTION

During the short period of its existence this section has done good work with reference to the study of long fibres other than jute. Particular attention has been given to the thorough study of *Hibiscus cannabinus* (Mesta) which has now been recognised

as a very close substitute for jute. Attention of Government of India has been drawn to the development and cultivation of this fibre crop on an "all India" basis.

The idea of studying the possibilities of machine extraction of fibre from the stems or leaves, especially of fibre plants like Ramie, Linseed and Agaves, to which the ordinary country process of retting and extraction does not apply satisfactorily, could not materialise due to the non-availability of suitable mechanical appliances for the purpose.

BOTANICAL AND AGRONOMICAL STUDIES

I. COLLECTION OF SEEDS, SUCKERS AND BULBILS OF VARIOUS KINDS OF FIBRE-YIELDING PLANTS :—

The collection of seeds, suckers, etc. of different kinds of fibre yielding plants from various sources was continued during the period under review and some additions were made to the original stock of last year. In most cases the seeds received were not enough for conducting any field trial. All such small samples were, therefore, grown for multiplication of seeds for future work.

II. OBSERVATIONS :—

With the seeds multiplied last season the following fibre plants were grown in comparatively bigger plots this year :— *Urena lobata*, *Urena sinuata*, *Sida rhombifolia*, *Abutilon spp.*, *Abroma augusta*, *Malachra capitata*, *Sesbania aculeata*, *Crotalaria juncea* and other species of *Crotalaria* and some *Hibiscus spp.*

Besides seed multiplication, other botanical, growth and developmental records were taken. Some fibre of each kind was also extracted by the ordinary processes of retting and extraction.

The quantities of fibre extracted from most of them were, however, not sufficient for assessing their respective merits as a jute substitute. For a preliminary test, however, some quantities of fibre of two species of *Urena* and one of *Sida* have been sent for Technological test along with the fibre obtained

from the line Vs. broadcast experiments on *Hibiscus cannabinus* and *Hibiscus sabdariffa* var. *altissima*.

All these fibre plants will be grown in still bigger plots next season for full-fledged agronomic trials and quality tests.

Urena lobata and *Urena sinuata* are both hardy perennials but they could be grown as annuals, as well, for fibre production. Under the prevailing weather conditions at Chinsurah Farm, both of them grew well attaining average heights of 7 ft. The length of branches ranged from 4 to 6½ ft. A number of tall types with few branches were selected for future study. The fibre of both these species was fine, lustrous and quite strong.

Sida rhombifolia also grew well and displayed type-differences based on pigmentation, height and branching habits. The fibre strands extracted from the stems and branches measured on an average about 5 ft. They were ivory-white, silky and strong. A number of desirable plants were selected for future work.

Abutilon plants were extremely branchy; but a few branched plants were found to be very tall and these were selected for future work. The fibre is very meshy, white and lustrous but not so much like that of *Sida*.

Abroma augusta like *Urena* is a hardy perennial but could as well be grown as an annual for fibre production. Sown before the rains it flowered in the field in latter part of the rainy season (September) under Chinsurah conditions. The vegetative period this year was comparatively much shorter than last year. The plants attained heights of about 10 ft. and produced soft silky fibre strands which were, however, extremely meshy.

Malachra capitata plants were extremely branchy at the top even in thick stands. The technical and effective height of the plant was on the average about 5 ft. Unlike *Sida*, *Urena* and *Abutilon*, the branches of *Malachra capitata* plants are much shorter and as such are almost useless for extraction of fibre of good length from them. The fibre like that of *Abroma augusta*, is extremely meshy but not so silky and soft as the former.

Sesbania plants grew to an average height of about 12 ft. Two types were identified one with spiny stems and branches and without any pigment on the vegetative parts and the other smooth and pigmented. The fibres are very coarse and harsh and as such cannot have possibly any place as a jute substitute. It may, however, perhaps be only used as raw material for ropes, brushes, mats, etc:

III. TRIALS :—

A. Hibiscus sabdariffa var *altissima*.—

Line sowing Vs. Broadcast sowing.—This complex cultural experiment was conducted this year on the same line as that of last year. The sowing was done on the 26th May, 1949.

The growth of the crop from the very start was excellent but at the later stage the plants were badly attacked by a mealy bug (*Phenacoccus hirsutus*) to a great detriment to the final development of the crop. Attempts were made to put this pest under check by Nicotine sulphate spraying.

Analysis of the yield data showed the error variance for the comparison of differential effects of the five main plot treatments, *viz.*, (*i*) Broadcast sowing (control), (*ii*) 12″ lines × light thinning, (*iii*) 12″ × 2″, (*iv*) 12″ × 4″ and (*v*) 12″ × 6″, was too high. This renders any comparison of the observed differences in yield amongst them, untenable.

On the other hand, differences due to the subplot treatments, namely, the three different stages of harvest, were, however, significant at 1 percent level of probability. Statistically the yield sequences were Flower stage, Bud stage, & Pod stage. The yield at Pod stage suffered due to damage of crop from attacks of mealy bugs at later stage of the crop.

The interactions between the methods of culture (main plot treatments) and stages of harvest (subplot treatments) were insignificant.

The results of the quality test of fibres, of the different treatments representing the three harvest stages with different methods of culture, are not yet available for report.

B. Hibiscus cannabinus.

Line Vs Broadcast. This was also another cultural experiment of the complex factorial type as in *H. sabdariffa* var *altissima*, mentioned above. The seed for this experiment was procured from South India. It was received rather late in the season and the sowing was therefore somewhat late.

The stand was poor and extremely uneven. This was partly due to soil heterogeneity but also seemed partly due to incomplete acclamatization of the South Indian seed to Chinsurah conditions.

C. Sunnhemp (Crotalaria juncea).—

A randomized and replicated triple-rowed progeny trial with the following strains of Sunnhemp was conducted during the Kharif season:— (*i*) White seeded (Kanpur), (*ii*) Black seeded (Kanpur), (*iii*) Black seeded (Palamau), (*iv*) Black seeded (New Delhi), (*v*) Black seeded (Srivilliputtur).

All these 5 strains in the test grew upto heights of about 8 ft. The growth characteristics, differences in leaf size and shape and the date of flowering of each were recorded. The strain No. 5 (from Srivilliputtur) proved the earliest in flowering, the average flowering date being 16th of July. The remaining four strains all flowered in September, *i.e.* about two months later than that of the strain No. 5.

At a very late stage of growth, immediately after flowering, a very severe form of disease appeared on the Sunnhemp plants and killed almost the whole crop in the experimental area. The stalks got absolutely discoloured and dried out completely. This rendered the stems absolutely of no use for fibre extraction and further study.

A varietal trial on Sunnhemp, with six strains obtained from different parts of India, was conducted on a field scale in randomised blocks with 6 replications. The strains under test were:— (*i*) Black seeded (Kanpur), (*ii*) White seeded (Kanpur), (*iii*) Black seeded (New Delhi), (*iv*) Black seeded (Gwalior), (*v*) Black seeded (Chindwara), (*vi*) Black seeded (C. P.).

The plants in all plots without exception were vigorous and tall but in the long run, all withered out completely prior to flowering due to water-logging. The whole root system was found submerged. The withered plants subsequently developed copious fungus growths. Too much rain and defective drainage system at the Chinsurah Farm were obviously responsible for this phenomenon. This Farm, for this reason, has proved not at all suitable for conducting any field trial on Kharif Sunnhemp which is remarkably sensitive to water-logging.

In the seed plots also the same phenomenon occured whereby very little seeds could be gathered from the different strains under observation and some of them were totally lost. For seed production of Sunnhemp also, only high lands with a low water table are needed.

D. Dual purpose Linseed.—

The two dual purpose linseed types which were tested last year for comparison were also tried, during the year under report, in a replicated paired-plot experiment of the same design as of last year. The preparation of land and sowing had to be done with irrigation from the Farm tube well.

It may be mentioned, in this connection, that at Chinsurah Farm it is not possible to conduct any experiment with winter crops without irrigation for which this Institute is entirely dependent on this Farm tube well. The supply if available at all is often untimely and irregular. As a result, linseed experiment could be sown only in December which was too late. Sowings of linseed must be done by the middle of November, at the latest. Due to late sowing the growth of the crop suffered and the seed yield has been very poor. Type "A" yielded 892.68 lbs. of straw per acre whereas Type "B" yielded 29.63 lbs. less, on the average.

The extraction of fibre from linseed straw has been kept in abeyance for want of suitable mechanical appliances.

A varietal trial with a few more of linseed types, which was under contemplation, could not be taken up for want of seeds.

IV. Special Fibres

1. Bast fibre Group

Ramie.—Area under *Ramie* was further extended during the year at Chinsurah Farm and the old plantation was maintained in proper condition. A fairly good quantity of seed has also been collected for distribution to intending growers. Machine decortication of fibre from the Ramie canes could not be undertaken for want of the necessary machine.

2. Hard fibres

Agaves (Sisal hemp).—In the marine and defence services sisal hemp, occupies a very important place in the fibre economy of the world. So, at the first instance, attention was concentrated to this fibre in preference to other fibre plants of this group.

One thousand bulbils of *Agave sisalana* were collected from South India and put in a nursery at Chinsurah Farm. Types with both smooth and spiny margins have been observed in this collection. They will be separated later after the plantlets have put up some more growth in the nursery.

The question of finding a suitable site for setting up a plantation with this available stock of *Agave* bulbils will soon arise when the plants will be of the required size for field culture. At Chinsurah Farm there is already a great scarcity of high land for extending research work on jute and other bast fibre crops; so no suitable site for *Agave* plantation seems to be available there.

V. Selections

Hibiscus cannabinus.—Altogether 642 plants were selected. They were classified into 5 distinct grades based on the distribution of pigments. Some selections have also made based on the leaf characters and early flowering habits. A number of them representing each type was also selfed for pure line culture next year.

Hibiscus sabdariffa var *altissima.*—18 bristled and 32 bristleless plants were selected. The bristled character in *altissima* is a great disadvantage. Bristled plants bruise the skin of the field-workers while working within the standing crop and irritates to a great extent the bruised surface due to an

acrid exudation which is secreted from the bristled hairs. A bristleless strain will obviate this disadvantage.

Sida rhombifolia.—23 selections were made from the *Sida* crop based solely on tallness and non-branching habit.

Urena lobata and *Urena sinuata.*—Only 6 plants could be selected from the crop of *U. sinuata.*

Abutilon spp.—5 plants were selected for tallness and sparsely branched characters.

VI. SEED MULTIPLICATION

Seeds of the following fibre plants were multiplied on a moderate scale for future use in the various experiments and for distribution in small quantities to the intending growers.

(*a*) *In Kharif season*

(1) *Hibiscus cannabinus,* (2) *Hibiscus sabdariffa* var *altissima,* (3) *Hibiscus sabdariffa* (from Accra, Gold Coast), (4) *Sida rhombifolia,* (5) *Urena lobata,* (6) *Urena sinuata,* (7) *Abutilon* spp., (8) *Malachra capitata,* (9) *Sesbania aculeata* (two types), (10) *Crotalaria juncea,* (11) *Hibiscus* spp., (12) *Boehmeria nivea.*

(*b*) *In Rabi season*

Linseed.—Type JW 7 and 3 types one each from Kanpur, Delhi and Sabour.

VII. CYTOLOGICAL AND ANATOMICAL INVESTIGATIONS

Anatomical investigations were continued as in last year. The distinguishing features of the important bast fibres from anatomical points of view were recorded and their reactions to colour test with phloroglucin and different strains were also noted.

The experience gained from these observations was utilised for the identification and report on fibres in a number of fibre samples received from different parts of India.

VIII. GENETICAL STUDIES

A few of the pigmented selections of last year, from the crop of *Hibiscus sabdariffa* var *altissima* were grown and they

were found to be heterozygous. A study of the genetical behaviour of progenies was undertaken during the year. The seggregates were examined, the different phenotypes were classified and a digenic ratio (9:3:4) was obtained. For further elucidation and isolation of genotypes some test crosses were made between the different phenotypes. A few more crosses were also made between the different *Hibiscus sabdariffa* strains (pigmented and non-pigmented) obtained from different sources, for the study of colour inheritance.

DISEASES

Detailed studies of the diseases in the fibre plants other than jute could not be taken up, due to want of sufficient staff. Routine observations however were kept regarding the incidence of various diseases.

Hibiscus sabdariffa var *altissima*.—*Phoma sabdariffa* and *Cercospora hibisci* in leaves were widespread; 'soft-rot' of stem due to *Sclerotium rolfsi* was found at the harvest stage. During routine germination test a fungus was isolated from seeds, which may prove to be seed borne. Work on this is in progress.

Crotolaria juncea.—Epidemic wilt was observed in one field, probably due to *Fusarium sp.* *Uromyces sp.* was very common and was responsible, to a great extent, for the failure of seed production in some of the fields.

Urena lobata.—In January, 1948, symptoms similar to that of "die-back" was observed on branches. On isolation *Fusarium sp.* was obtained in culture. In 1949 artificial inoculum, under field conditions, failed to produce any symptoms, in plants raised in sterile soil in pots.

The disease, however, was observed in the same plot where it was first seen in 1948.

Canabis sativa.—A fungus was isolated from the seeds obtained from Turkey. The seed samples were found to have completely lost their viability.

PESTS

Studies on *Phenacoccus hirsutus* on *H. sabdariffa* var *altissima* was continued. Periodical observations in the field showed that the seat of infestation was mainly confined to the nodal joints of the succulent apical region of the host. Attacks on apical leaves were however frequently met with in very young plants.

Elaborate studies on the internal structure of the affected stem indicate that hypertrophy of the cortical and pith cells is caused in radial direction with the formation of 'giant cells' in most cases, in the inner layer of cortex. Vessels and trachieds of the secondary xylem are less lignified and thin walled.

For chemical control of *Phenacoccus hirsutus* different insecticides have been tried in the laboratory in replicated petri-dish trials. Of these 1.5% Nicotine sulphate solution has been found to be effective (Table XXII).

TABLE XXII

Treatment	Mean Kill %
Nicotine sulphate sol. — 1.5%	82.3
,, ,, ,, 1%	70.9
,, ,, ,, 0.5%	62.3
Lime-sulphur sol. (sp. gr. 1.32)	
1 part lime sulph : 24 part water	62.0
1 ,, ,, ,, : 49 ,, ,,	48.5
Lime-sulphur Dust — 3 : 1	41.8
Guesarol (50% water base D.D.T.) 2% suspension	32.9
Agrocide (Wettable BHC) 2% ,,	23.2
Gammexane D.025	21.0
Control	0.0
C.D.	30.6

MISCELLANEOUS

Enquiries.—A considerable number of reports and comments on equiries of various types relating to jute and substitute fibres were written and submitted during the year under report.

Exhibitions.—Different types of jute and many other soft and hard fibres including mesta and Roselle were exhibited to many visitors to the Institute and also in Agricultural Exhibitions.

New Appointments.—The following new appointments were made during the period under report:—

Sri A. T. Sanyal—Agronomist.

Dr. B. K. Kar—Physiologist.

Sri A. K. Paul—Asstt. Botanist.

Sri K. L. Ghosh—Scientific Assistant, Botanical Section.

Sri S. K. Mukherjee—Junior Botanical Anatomist.

Sri S. Banerjee—Librarian.

Visitors.—Among visitors to the Institute during the year the following may be mentioned:—

Sri K. L. Panjabi—Secretary, Ministry of Agriculture, Government of India.

Sir Datar Singh—Additional Secretary, Ministry of Agriculture, Government of India and President, Indian Central Jute Committee, Calcutta.

Mr. Cleveland B. McKnight—American Vice Consul.

Sri J. N. Talukdar—Commissioner, Presidency Division, West Bengal.

Sri B. B. Sarkar—Commissioner, Burdwan Division, West Bengal,

and

2 members of the F.A.O.

PUBLICATIONS

The following is a list of papers published during the year :—

1. Kundu, B.C. (1949)—Ramie fibres and need for development of plantation in India. The Hindu Republic Special Number.

2. Kundu, B.C. (1950)—Jute Research in India. March of India, March, 1950.

3. Kundu, B.C. (1949)—"A short note on line sowing of jute". Jute Bulletin, July, 1949.

4. Dutt, N., Mukherjee, P. K. and Sen Gupta, N. (1950)—Effect of the incidence of *Phenacoccus hirsutus* Gr. on growth and development of *Hibiscus sabdariffa* var *altissima*.—In press Indian Journal of Agricultural Science.

B. C. KUNDU,
Director,
Jute Agricultural Research Institute,
Hooghly, West Bengal.

APPENDIX

Programme and Progress of work

JUTE

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
BREEDING & GENETICS OF JUTE.		
1. Collection of varieties and types including wild species of *Corchorus*.	17 cultivators' samples of jute seeds were received and grown. Four of the samples failed to germinate. The rest of the materials were studied and selections were made for yield and other characters. A planned collection was arranged as soon as the field staff of the Jute Development Scheme joined. They could send seeds only after 1949 seed crop was harvested. In all 132 samples of seed were received from them by the end of March, 1950. The seeds were preserved for sowing during next season. *C. capsularis* (wild) from Bombay and *C. tridens* collected locally were added to the list of wild species of *Corchorus* in our collection. Occurrence of a true wild *C. capsularis* in India is reported for the first time.	Collection of types from unrepresented jute growing areas will be continued and intensive study of the individual types and isolation of fresh breeding materials from year to year carried out.

2. Breeding of improved strains of jute.	21 breeding trials were carried out with 614 different materials brought forward from previous year's crop. Of these 5 late-sown *olitorius* trials failed due to advent of the monsoon soon after their sowing. 9226 selections were made in these trials for further study. Besides 82 selections were made in multiplication plots of multiple crossing materials not included in trials for shortage of seed. In the first year test of selections an *olitorius* selection, O48-525, proved significantly superior to the control (C.G.) in yield by 40%. In all 43 promising cultures from different trials including trials of multiple crossing materials were carried forward.	Test of primary selections and further test of materials carried forward from 1949-50.
Polyploidy and interspecific hybridization in jute.	Of 825 capsules collected from 11 *capsularis* and 1 *olitorius* plants from colchicine treated series 280 capsules had no seeds. The remaining 545 capsules were sown separately. 2901 *capsularis* and 906 *olitorius* plants were obtained and studied. Only 28 *capsularis* plants showed morphological characters similar to those of polyploids. 5 of the 10 interspecific crosses, which yielded some seeds, were sown. 3 of the crosses with capsularis as female parent had	Study of materials in hand and fresh treatment of *capsularis* and *olitorius* seeds with colchicine.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
	apparently all sterile seeds and failed to germinate. The rest 2 crosses with *olitorius* female parent gave 41 plants in all. Morphologically these plants looked like normal *olitorius* plants. Seeds of 6 plants were carried forward for further study.	
Vegetative rapprochement as a means of overcoming inter-specific cross-incompatibility in jute.	Seeds of 26 grafts were sown. Sowing was delayed due to weather conditions. The plants did not grow well. No second generation grafts could be made. Seeds of selections were carried forward. 15 fresh grafts were attempted with 8 successes. Seeds from the scions were carried forward.	Attempts of successive inter-specific grafting and crosses between grafts of the two species will be continued.
3. Inheritance of characters. Genetic strains.	In all 105 selections were grown in a purification series. The cultures breeding true to the type were classified under a pure series. The total number of strains under this series is at present 45. 98 selections from different sources were carried forward for further study and purification.	The work will be continued and fresh strains will be added to the list from year to year as and when new characters are fixed.

Isolation of genotypes.	The F_1s between the green type Dhaleswar and 3 members of the Red group were studied and confirmed. 2 F_1s from each type of cross were carried forward for isolation of 5 full-green genotypes.	Test-crosses will be made in the F2 population for isolation of the 5 full-green genotypes. Confirmation of the genotypes after study of the hybrids.
Serrated petal in *Olitorius*.	Crosses obtained last year between serrated and ordinary petal types were grown and the F_1s were studied. 6 F_1s were carried forward.	Study of F2 populations and classification of phenotypes.
Blotched leaf in *Olitorius*.	Progenies of the selection of blotched leaf character were found to be segregating.	Inheritance of this character will be studied later, when fixed material is obtained.
Anthocyanin pigmentation in *capsularis*.	The study of the mode of inheritance of pigmentation in a deep-red *capsularis* type in our collection, that may be said to be the highest member of the red group was taken in hand and suitable crosses with all other *capsularis* pigmented types were made.	Study of F_1s and back crosses to be made.
	The mode of inheritance of anthocyanin pigmentation in foreign types, and their performance when crossed with Indian types have been taken in hand. Some crosses have been made between available types.	Study of F_1s and back-crosses and further crosses to be made.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
Extra-axillary branching habit in *capsularis*.	To study the inheritance of this character in some of the foreign strains in our collection,, crosses were made between these types and Indian types that have normally axillary branches.	Study of F_1s and back-crosses to be made.
Repand (wavy) leaf in *capsularis*.	A wavy leaf-margin type located in our collection was crossed with normal type to study the inheritance of this character.	Study of F_1s and back-crosses to be made.
Leaf variant.	Segregates in the progenies of a selection, C48-8565, made in old Dacca materials gave normal plants and plants with deeply serrated leaves. The latter plants were observed to be self-sterile. Crosses were successfully made between normal plants and the leaf-variant using the latter as the male parent. Selections from the normal segregates and crosses were carried forward. The variant was dissected and fully described and materials were fixed for cytological study.	Further study of the materials carried forward.

ANATOMICAL AND CYTOLOGICAL INVESTIGATIONS.		
Anatomical studies with special reference to fibre formation.	Study of comparative anatomy of the tips of different jute types was in progress.	To be continued.
Study of fibre characteristics in jute and substitutes.	Length, breadth & lumen of jute and some important substitutes (*H. cannabinus*, *H. sabdariffa* var. *altissima*, H. *abelmeschus*, *Abroma*, *Sida*, *Malachra & Urena*) were measured and studied.	To be continued.
Cytological study of the colchicine treated jute plants.	In progress.	To be continued.
Study of chromosomes.	In progress.	To be continued.
PHYSIOLOGICAL STUDIES.	The Physiological section of the Institute was started in December, 1949.	1. Retention of viability in different varieties of jute seeds both wild and cultivated.
	Organisation of the laboratory was first taken in hand and is still in progress. Meanwhile investigations on stored seeds of different species and varieties of jute were done with a view to find out (*a*) their germination capacity, (*b*) reaction to different salts as Nacl & Kcl (*c*) different pH range.	(*a*) The different causes for the slow decrease in the germination percentage of jute seeds are to be investigated in all its aspects.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
		2. Studies in the comparative root growth in different varieties of jute in correlation with (*a*) different phases of growth (*b*) different nutritional levels. 3. Cultural investigations. (*a*) Salt toleration in different varieties of jute. The effect of different concentration of salts—NaCl & KCl at different stages of growth with a view to find out salt resistant types. (*b*) Effect of different pH range on growth. 4. Studies in the water-relation with different levels of nitrogen fertilizers.

Cultivation.

1. Line growing of Jute.

Line *Vs.* Broadcast

(*i*) Material—Capsularis (D154).

The treatments included spacings of 2″ × 12″, 3″ × 12″, 4″ × 12″, light thinning × 12″ against usual broadcast sowing. The broadcast plot was weeded as usual three times. The line plots received 1st weeding by hand and the subsequent intercultural operations were only wheel-hoeing for three times.

The profits from various treatments are given below:—

		Profit per acre
1.	Broadcast ...	Rs. 110/15/6
2.	Light thinning × 12″ spacing ...	,, 236/ 0/6
3.	2″ × 12″ spacing ...	,, 208/ 4/3
4.	3″ × 12″ spacing ...	,, 244/ 9/9
5.	4″ × 12″ spacing ...	,, 259/15/6

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
(*ii*) Material-*Olitorius*.	The treatments included the spacings of 2″ × 12″, 3″ × 12″, 4″ × 12″, light thinning × 12″ against usual broadcast sowing. The profit from the various treatments is given below :— *Profit per acre.* 1. Broadcast ... Rs. 494/13/9 2. Light thinning × 12″ spacing ... ,, 686/11/- 3. 2″ × 12″ spacing ... ,, 681/12/3 4. 3″ × 12″ spacing ... ,, 672/ 1/6 5. 4″ × 12″ spacing ... ,, 668/14/6 *Capsularis* yields were rather low. This was due to continued water-logged conditions in the early stages of crop growth. In the *capsularis* trial the cost of production in line plots was lowered by about 25% than broadcast plots. The yields increased somewhat in line plots and profits also were much higher than broadcast. In the *olitorius* trial the cost of production in line plots was lowered by about 20%. The yields in line plot increased though the increases were not significant, and the profits were much higher than in broadcast plots.	Both the experiments are to be continued. A few more spacings will be tried including double and single row treatments.

2. MANURIAL TRIALS. (*i*) Trial No. 1— Material— (*Capsularis* D154) To study the effects on yield and quality of varying doses of Nitrogen and Potash and to compare the effects of organic manures and inorganic fertilizer on yield and quality of fibre.	The treatments included 30 and 60 lbs. of Nitrogen, 25 and 50 lbs. of K20 per acre and various combinations of N & K; compost, sludge, F.Y.M. and no-manure (as control). Percent increase in yield obtained on control (no-manure) from various treatments were as follows:— Compost—190.4%, N2K1—184.6%, N2K2—182.3%, N2—172.9%, N1K2—173.5%, N1K1—164.5%, N1—154.1%, F.Y.M.—152.0%, K2—146.4%, Sludge—140.7%, K1—137.7%. Applications of both N & K when used alone increased the yield, the yield increasing more with increased doses. N, however, gave very much higher yield than K. Combinations of N. & K gave better results than when used alone. Increase in yield from F.Y.M. was slightly more than sludge. Compost gave the highest yield, closely followed by N2K1 and N2K2.	The quantity of Nitrogen, from Compost, sludge and F.Y.M. were very different and also rather excessive. Treatment of reduced quantities of these manures will be included in the next year's trial.
(*ii*) Trial No. 2—Material *Olitorius* (C.G.)	The treatments were the same as in previous experiment, only the species was different (C.G.) The percent increase in yield on control (no-manure) from various treatments were:—	

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
To study the effects on yield of varying doses of Nitrogen and Potash and to compare the effects of organic manures and inorganic fertilizers on yield and quality of fibre.	N2K2—130.0%, Compost—138.5%, N1K2—135.9%, N2K1—131.8%, N2—125.8%, N1K1—123.2%, K2—111.4%, N1—109.5%, Sludge—105.9%, K1—102.9% & F.Y.M. gave 4.2% less yield than control. Both N & K increased yields when used alone or in combination. N increased the yield much more than K. Compost, N2K1, N2K2, N1K2 gave much higher yields. Beyond 39% the yields did not increase and there perhaps seems to be a limit to which *Olitorius* yields can be increased by manuring unlike *Capsularis*. F.Y.M. did not seem to have given any response and in fact somewhat suppressed the yield.	Separate studies of effects of various doses of F.Y.M. on capsularis and olitorius in a combined trial is to be taken up.
(*iii*) Trial No. 3—Material—*Capsularis*—(D154)	The treatment included single and double doses of compost, sludge, F.Y.M., and 20, 40 & 60 lbs. of Nitrogen (Ammonium sulphate) per acre, and no-manure (as control). The percent increase in yields on control (no-manure) from various treatments were as follows.—	The experiment is to be continued.

To compare the yield and quality effects of varying doses of Nitrogen from organic and inorganic sources.	Compost (2)—192.6%, Compost (1)—178.4%, N-60—166.4%, N.40—145.6%, F.Y.M. (2)—142.5%, Sludge (2)—137.2%, N.20—136.4%, F. Y. M. (1)—120.9%, Sludge (1)—112.3%. The yield increased with increasing doses of Nitrogen. Compost was found to give the best results. F.Y.M. gave slightly better yields than sludge.	
(*iv*) Trial No. 4—Material—*Olitorius* (C.G.)	The treatments were the same as in manurial trial No. 3, only the species was *Olitorius*. The percent increase in yield on control (no-manure) from various treatments were as follows :—	This is to be continued and some more reduced rates of compost, F.Y.M. and sludge treatments, to be included.
To compare the yield and quality effects of varying doses of Nitrogen from organic and inorganic sources.	Compost (1)—123.9%, Compost (2)—117.1%, Sludge (2)—122.5%, N.40—117.1%, N.20—117.5%, N.60—114.6%, Sludge (1)—106.4%, F.Y.M. (2)—103.2%, F.Y.M. (1)—98.9%. The yield increased with increasing doses of Nitrogen. Compost proved to be the best. F.Y.M. did not seem to give much increased yields. It appeared that yield in *Olitorius* could not be increased, beyond a certain limit unlike in *Capsularis*.	

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
3. INTERCULTURAL EXPERIMENTS. (*i*) Interculture in broadcast crop of *Capsularis* (D154). To study the effects on yield, quality and cost of production of different frequency & number of times of intercultural operations in Jute.	Abnormal and continuous heavy rains, especially at the earlier stages interfered very much with proper interculture operations this year which was far from normal. The results indicated that more frequent inter-culture gave better yields. Earlier weeding, however, should be preferred and that the number of weedings might be reduced by early weedings.	The work is to be continued. The studies on the economics of intercultural operations, total costs of production and value of produce will be included.
(*ii*) Interculture in broadcast *Olitorius* (C.G.). To study the effect on yield, quality & cost of production of different frequency & number of times of intercultural operations in jute.	Abnormal and continuous heavy rains, especially at the earlier stages interfered very much with proper interculture operations this year which was far from normal. It was found that earlier weedings gave better results than late weedings.	The work is to be continued. Studies on the economics of intercultural operations and total costs of production and value of produce will be included.

(*iii*) Interculture in line grown *Capsularis*. To study the effects on yield and quality from different frequency and number of times of intercultural operations when jute is grown in lines.	No significant difference between treatments was noticeable.	The experiment will be continued. Study of the economics of intercultural operations and total costs of production and value of produce will be included.
(*iv*) Interculture in Line grown *Olitorius*. To study the effect on yield and quality of different frequency and timing of intercultural operations in line sown jute crop.	Abnormal and continuous heavy rains, especially at the earlier stages interfered very much with proper intercultural operations this year which was far from normal. No significant difference was noticeable.	This work is to be continued. Study of the economics of intercultural operations and total costs of production and value of produce will be included.
4. TRIPLE AND DOUBLE CROPPING OF JUTE LAND. (*i*) Triple-cropping with *Olitorius* (Jute-paddy-berseem). To study the possibilities of triple-cropping with *Olitorius* jute-paddy-berseem, under Chinsurah conditions, in the same year.	The treatments for jute included harvests of (*a*) C.G. at pre-bud stage, (*b*) C.G. at bud stage, (*c*) C.G. at flower stage, (*d*) 039-620 at pre-bud stage. (*e*) 039-620 at bud stage, (*f*) 039-620 at flower stage. Berseem as third crop was not possible to grow. The yields of fibre obtained per acre in maunds were as follows:—(*a*) 13.6, (*b*) 15.3, (*c*) 17.1, (*d*) 14.6, (*e*) 16.9, (*f*) 18.8. For jute flower stage harvests gave better yields than earlier stages of harvest. Maximum paddy yields	This experiment will be continued with a few more cropping sequences and treatments of jute alone, paddy (aman) alone, jute and paddy will be included. For the third crop Berseem should be replaced by pulse crops like 'Khesari' and 'Kalai.' Studies of soil exhaustion will be included. For paddy, both early and late varieties will be included.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
	were obtained from the plots where paddy could be transplanted earlier (*i.e.* plots released from pre-bud stage harvest of jute). When the value of both the produce (jute and paddy) was considered, maximum return from the produce was obtained from flower stage harvest of plots of the first crop (jute).	
(*ii*) Tripple-cropping *Capsularis* (Jute-paddy-mustard) (High Land). To study the possibilities of triple-cropping with *capsularis* jute-paddy-mustard under Chinsurah conditions.	The treatments in jute included harvests of early jute (Fanduk) at (*a*) pre-bud stage, (*b*) bud-stage and (*c*) flower-stage; and late jute (D154) at (*a*) pre-bud stage, (*b*) bud stage and (*c*) flower stage. The results were very similar to triple-cropping experiment with *olitorius* as previously mentioned.	It is very doubtful if a satisfactory third crop of mustard will be possible. Perhaps the third crop has to be a pulse or a fodder. This experiment will be conducted with a few other cropping sequences. Soil exhaustion studied will be included. For paddy, both early and late varieties will be included.
(*iii*) Double- cropping. (*Capsularis* Jute-paddy in low lands).	The treatments included harvests of early jute (Fanduk) at (*a*) bud stage, (*b*) flower stage and (*c*) pod stage; and late jute (D154) at bud stage, (*b*) flower stage and (*c*) pod stage.	This experiment will be continued in low land.

To study the possibilities of double-cropping with jute and paddy in low-lands under Chinsurah conditions.	Owing to abnormally heavy and continuous earlier rains, the land got flooded and the crop was totally submerged in water and the whole crop was lost.	
5. EFFECT OF DATE OF SOWING ON PLANT GROWTH, FLOWERING AND YIELD. (1) To study the effect of date of sowing on plant growth, flowering and yield; and (2) on incidence of diseases & insect pests. (*i*) *Olitorius*—(C.G.)	(*i*) The treatments included fortnightly sowings starting from 16th March to 1st July. The crop was harvested at small pod stage. With the exception of first sowing the earlier sowings gave better yields. It may be pointed out here that the earlier sowings in March and April had to be irrigated without which neither germination nor proper crop growth was possible. In conclusion it may be said that the earliest sowing with *Olitorius* can be done in April successfully provided irrigation facilities are available. In the absence of any irrigation facility the *olitorius* crop under Chinsurah conditions can only be sown in the end of April or beginning of May.	The experiment will be continued.
(*ii*) *Capsularis*—(D154).	(*ii*) The treatments included fornightly sowings commencing from 16th March to 1st July. The earlier sowings beginning from March gave better crop performances. Sowings after May did not seem to be of any use.	The experiment will be continued.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
6. YIELD AND QUALITY OF FIBRE AT DIFFERENT STAGES OF MATURITY.		
(*i*) *Capsularis*—(D154).	The treatments included harvests at well before bud stage, just before bud stage, bud stage, 50% flower stage, early pod stage, pod stage, mature pod stage and control of harvest at usual small pod stage. Fibre yield increased with advanced stage of harvest. Harvest at 50% flower stage up to small pod stage gave better results. Harvest, earlier than at 50% flower stage did not seem to be economical. Fibres sent for technological tests.	To be continued.
(*ii*) *Olitorius*—(C. G.)	Experiment with *olitorius* could not be taken up for want of suitable land.	To be taken up.

SOIL AND MICROBIOLOGICAL STUDIES. (*i*) Biochemical studies of retted jute, retting water and soil.		
(*a*) Action of different activities on the retting of jute.	Jute stems together with different proportions of natural substances were retted, in the laboratory. Straw, Sunnhemp and fruits of *Putranjiva roxburghii* (Wall) were found to have properties of reducing the retting period considerably.	To be continued. These reactions will be studied in details to find out the exact causes of shortening of retting period. Effect of different nutrients like N & P etc. in different chemical forms on the period of retting will be observed on a laboratory scale.
(*b*) Isolation and characterisation of specific strains of bacteria and fungi responsible for retting of jute.	Isolation of different strains of bacteria in the pure state from the retting water at different stages of retting have been done. Their action on jute retting under aseptic condition is being carried out. Three strains of acrobic bacteria which are able to ret jute have already been isolated. Their characteristics are being studied.	To be continued. Properties of the strains are being investigated. Attempts will be made to isolate more strains. The enzyme system responsible for retting will also be studied.

Programme ot work as sanctioned	Progress of work in 1949-50	Programme of work in 1950-51.
(*ii*) Analysis of soils & manures for their chemical and mechanical constituents.	Analysis af samples from Krishnagar and Barrackpore were done.	Analysis of samples of other places will be done with a view of soil survey. Analysis of manures and fertilizers will be done.
		(*iii*) Utilization of primary nutrients like N, P & K by the jute plant.
		(*a*) Periodic analysis of total, available and exchangeable Nutrients, pH, Organic matter of Soil samples in Double and Triple-cropping plots.
		(*b*) Analysis of Total, Available and exchangeable nutrients, pH, organic matter and fixation of phosphates in manurial plots.
		(*c*) Withdrawal by the plant of N, P & K.

		(*iv*) Development of method and determination of nutrients for advisory work in connection with manuring etc.
		(*v*) Role of plant nutrients and soil conditions regarding susceptibility to diseases.
		Soils of such area which are susceptible to diseases to be investigated to test whether deficiency of nutrients and pH are factors for such plant diseases.
DISEASES.		
1. Study of the effect of environmental factors on secondary leaf infection due to *Macrophomina phaseoli.*	Earlier sown crops were better adapted to resist infection than late sown crop, as the younger crops were more susceptible during critical period of infection than the older ones.	To be continued.
2. Study of the stem-rot fungus.		
(*i*) Inoculation experiments.	Germination studies of sclerotia produced in artificial culture were made. Sclerotia germinated freely in tap-water.	To be continued.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
(*ii*) Study of cultural characteristics.	21 cultures from different sources and from different hosts were collected.	To be continued.
3. Study of the biology of pathogens other than *Macrophomina phaseoli*.	The perfect stage of *Sclerotium rolfsi* causing soft-rot in jute was found to be basidial.	To be continued.
	'Cholorosis' in various aspects was studied. It was found that chlorosis was transmissible through grafting. Single plant seeds were collected from chlorotic individuals for study in 1950-51.	
4. Investigation on the methods of control of stem-rot, root-rot and other diseases.		
(*i*) Selection and breeding of stem-rot resistant types.	153 selections were tested in 3 separate replicated trials. 52 have been brought forward for further studies.	To be continued.
(*ii*) Application of fertilizer to check incidence of disease.	Results were inconclusive.	Will be repeated.

(*iii*) Seed treatment and storage.	Results indicated the importance of drying seeds before storage and storing the seeds in dry conditions. Seeds harvested in December, 1948 retained viability after 19 months of storage under proper storing conditions. Agrosan GN and Landesan, two commercial seed disinfectants were found to be equally effective in their fungicidal action against *Macrophomina phaseoli.*	Old and new seeds will be sown in the same field in a replicated trial to ascertain their performance in yield.
(*iv*) Chemical sprays to control leaf infection.	Lime sulphur (2%), perenox (2%), and copper lime (16% cu. 5% sol.) were tried as a prophylactic spray against leaf infection. Conclusions were not drawn as control plots remained disease free.	Will be repeated.
PESTS. 1. Investigation on the methods of control of *Apion corchori.*	1. γ-BHC was found to be partly effective under field condition to prevent *Apion* oviposition.	
	2. Study of relative resistance of *olitorius* & *capsularis* indicated that the amount of *Apion* attack was higher in *capsularis* in early crop season while the incidence increased later, both in extent and intensity, in *olitorius* in comparison to *capsularis.*	
	3. 81 single plant selections for *Apion* resistance were made for next year's trial.	Detailed study on resistance against *Apion corchori.*

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
2. Investigations on control measures for other pests.	Investigation on the incidence of pests on crop sown on different dates.	To be continued.
(*a*) cultural control.	(*i*) *Laphygma exigua* caused more damage to early sown crop.	
	(*ii*) Incidences of *Apion corchori* was spread over throughout the entire crop season, though such incidence was much less in late sown crop but such sowing cannot be practised because of poor and uneconomic yields.	
	(*iii*) Early sown crop escaped attacks by *Anomis sabulifera*.	
	(*iv*) Early sown crops were more susceptible to *Hemitarsonemus latus*.	

SUBSTITUTE FIBRES

1. Collection of varieties and types.	Collection of seeds of different fibre plants, belonging to the bast fibre group, was continued and some additions were made to the original stock. 1000 bulbils of *Agave sisalana* were procured from South India and planted in a nursery with a view to set up a plantation in near future.	Collection of seeds etc. will be continued.
2. Observations. Preliminary observations for a close study of the characteristics of different fibre plants from botanical, growth and developmental points of view.	All the distinguishing features in the growth and developmental characteristics of the following fibre plants, were recorded :— (1) *Urena lobata*, (2) *Urena sinuata*, (3) *Sida rhombifolia*, (4) *Abutilon* spp., (5) *Abroma augusta*, (6) *Malachra capitata*, (7) *Crotalaria* spp., (8) *Hibiscus* spp.	Initial observations of this nature will be continued, in future, as a routine work along with the growth of the collection.
3. Agronomic and breeding trials. (*i*) Line *vs.* Broadcast sowings of *Hibiscus sabdariffa* var *altissima*.	Statistical analysis of the results showed high error variance and so any comparison of the observed differences in yield between the 5 different cultural methods was not possible. Differences due to different stages of harvest were, however, significant.	To be continued.
(*ii*) Line *vs* Broadcast sowing on *Hibiscus cannabinus* (Mesta).	The trial was conducted on the same line as that of *altissima*. There were no significant differences between treatments.	To be continued.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
(*iii*) Varietal trial on Sunnhemp.	A varietal trial on 6 Sunnhemp strains was carried out in replicated randomised blocks. The plants in this experiment grew very vigorously but later at the advanced stage of growth were all killed due to an unusual rise in the subsoil water table.	To be continued.
(*iv*) Comparative trial of dual purpose linseed types.	Two dual purpose linseed types were tried in a replicated paired-plot experiment. The yield of straw of the two types of linseed under unvestigation were statistically at par, the respective averages being 892.67 lbs. and 263.05 ibs. per acre.	To be continued with few more types.
4. Selections.	Suitable selections were made based on various characters in following crops:— *Hibiscus cannabinus*, *H. sabdariffa* var *altissima*, *Sida rhombifolia*, *Urena sinuata*, *abutilon* spp.	Detailed studies of the selections to be continued and fresh selections to be made.
5. Special fibres.		
(*i*) *Ramie.*	The *Ramie* plantation at the Chinsurah Farm was further extended this year. A good quantity of seed was collected for distribution to intending growers.	The existing Ramie plantation will be maintained in proper conditions. Seeds will be collected.

		Machine decortication of Ramie canes will be attempted if a suitable decorticator is available.
(*ii*) Hard fibres.	One thousand bilbils of *Agave sisalana* were obtained from South India and put in a nursery at Chinsurah Farm.	The *Agave* bulbils, after they have attained the required size in the nursery will be planted out in the field and the plantation will be maintained in proper conduction for future work.
6. Seed Multiplication.	Seeds of the different fibre plants under study were multiplied on a moderate scale for future investigations.	To be continued.
7. Anatomical and Cytological investigations.		
(*i*) Anatomical studies on the growth and development of fibre.	Study of the characteristics of different fibre plants under investigation was continued and their peculiarities were recorded. The experience gained from these studies was utilised in the identification of a large number of fibres samples received from various sources.	To be continued.

Programme of work as sanctioned	Progress of work in 1949-50.	Programme of work in 1950-51.
(*ii*) Cytological investigations.	Cytological investigations were continued on the lines outlined last year.	To be continued.
8. Physiological studies.		Nutritional investigations. Effect of different sources of organic and inorganic nitrogen on vegetative growth and initiation of flowering in *Hibiscus cannabinus* and *H. sabdariffa* var *altissima* under field conditions.
9. Diseases		
Incidence of diseases on fibre crops other than jute and their control.	Work on fungi recorded last year was in progress.	To be continued.
10. Pests.		
Investigation on the biology and control of pests.	Further studies on the biology of *Phenacoccus hirsutus* were made. 1.5% Nicotine sulphate solution was found to be effective against the pest.	To be continued.

APPENDIX II

ANNUAL REPORT ON THE TECHNOLOGICAL RESEARCH SCHEME FOR 1949-50

I. INTRODUCTION

There have been some notable changes in the Technological Research Laboratory during the year under review, the most important of which is the retirement in July last of Mr. C. R. Nodder, who held the post of the Director since its inception in 1938 and was largely responsible for giving it the present shape. His long association with the staff has been uniformly pleasant. He will continue to serve the Committee as a member of the Technological Research Sub-Committee. Shri S. S. Paul, B. Sc., who has overseas training in jute manufacturing process and more than 12 years' practical experience in the industry in India, joined as Manager, Experimental Spinning Mill in September last. The Indian Central Jute Committee has decided to take over the X-ray Scheme under Prof. S. C. Sirkar from the Calcutta University to this laboratory. The plant is proposed to be housed in a small extension—the construction of which is to start shortly. After several years' efforts equipment of the chemical technology block is now complete; a skeleton staff has recently been sanctioned to commence work therein. It has also been decided to start a small weaving section as early as possible to facilitate the work on linseed fibre (*vide infra*). Constructional work is expected to commence soon. A decision to study the problem of chemical retting of jute was made and necessary staff sanctioned in the last July meeting. Work will be started as soon as the appointments are made.

II. BACKGROUND RESEARCH

(*1*) *Hemicelluloses of Jute fibre.*

A preliminary report on the 50% alcohol-insoluble hemicellulose, extracted from chlorite holocellulose in the form of a white powder with 9.3% caustic soda, was made last year.

The work has been continued during the year and the more interesting results so far obtained are briefly given below:—

(*i*) The product, after repeated purification, appears to be a homogeneous body, consisting of six xylose units linked with a monomethoxy uronic acid, $C_6H_8O_7CH_3—(C_5H_8O_4)_5—C_5H_9O_4$. Various analytical data such as methoxy value, ash content, acid value, carbon dioxide content, etc. fairly agree with this composition; the furfural value is however somewhat lower than the theoretical figure.

(*ii*) It does not reduce Fehling's solution but on hydrolysis with dilute mineral acids, yields xylose. The maximum yield of reducing sugar, calculated as xylose, after hydrolysis is about 72%.

(*iii*) On hydrolysis with mineral acids, the methoxy-uronic acid united with *one* xylose unit is obtained—xylose-free uronic acid has not been yet possible to isolate. The barium salt of this complex acid has been isolated in the pure state. Analytical data such as carbon dioxide value, barium content, methoxy value, etc. support the composition, $(C_5H_9O_4—C_7H_{10}O_7)_2$ Ba.

(*iv*) Exhaustive studies on paper chromatography failed to indicate the presence of any other constituent such as a hexose or arabinose from the hydrolysate of the hemicellulose powder (50% alcohol-insoluble).

(*v*) The hemicellulose powder is highly hygroscopic—much more than raw jute—and it has been suggested that the high hygroscopicity of jute fibre is largely due to the presence of this hemicellulose fraction (*vide Sci. & Cul.* 1950, 15, 328).

(*vi*) This alcohol-insoluble hemicellulose represents about half of the hemicelluloses in jute fibre. The alcohol-soluble portion is a hexose; this is now being examined in detail.

This work is being done by Dr. P. B. Sarkar and Shri A. K. Mazumdar.

(2) *Effect of storage on chlorite bleached jute.*

In order to see how a jute yarn bleached with Textone deteriorates on storage, a fairly uniform yarn (LY2055) was bleached in November, 1947 with 1.1% Textone, for one hour at the temperature of boiling water-bath in a yarn-liquor ratio 1 : 20 and washed with water. It was then treated with dilute sulphurous acid and again washed thoroughly with water. The colour of the bleached yarn was pale yellow. The bleached yarn was stored in a well ventilated room, free from laboratory fumes and tested periodically. The results shown below indicate that the loss in strength is not appreciable during the storage for $26\frac{1}{2}$ months.

Yarn Ref. No.	Grist	Breaking load(lb)	Quality ratio	Period of storage (days)	%Loss in strength
487 ...	9·7	8·94±·111	94·1	Nil	
488 ...	9·72	8·95±·109	92·1	48	-0·11
489 ...	9·24	8·81±·105	95·3	128	1·45
490 ...	9·48	8·74±·108	92·2	174	2·24
491 ...	9·46	8·47±·103	89·6	423	5·26
492 ...	9·32	9·12±·109	97·9	475	-2·01
493 ...	9·5	8·01±·106	84·3	567	10·40
494 ...	9·4	6·9±·09	74·0	630	22·82
495 ...	9·4	7·6±·10	81·0	699	14·99
496 ...	9·29	8·07±·115	86·8	732	9·73
497 ...	10·2	7·3±·09	72	805	18·35

After-yellowing of the bleached sample occurred as usual, and the colour became quite dull.

(3) *Jute fat and wax.*

Jute fibre normally contains a little fat and wax, the amount of which varies from sample to sample in the same variety; capsularis fibre, as a rule, has a higher percentage than the olitorius (*vide* Jute Bulletin, Vol. II, 1940, p.229.) The amount extracted also depends, as in the case of cotton, on the nature

of the solvent. Some preliminary work on jute fat and wax has been done and the more important results are stated below :—

Ref. No.	% Fat and wax extracted with						
	Alcohol-benzene (1:1)	Alcohol	Acetone	Chloro-form	Ether	Benzene	Carbon tetra-chloride
J-1347 (cap.)	0·91	0·66	0·56	0·45	0·73	0·29	0·46
J-55 (cap.)	1·50	1·34	1·31	0·92	0·69	0·63	0·54

Alcohol-benzene mixture extracts the maximum amount. From the above figures, it will be seen that *it is necessary to mention the solvent employed while indicating the fat and wax content of a jute sample.*

The saponification value, percent unsaponifiable matter, iodine value, etc., determined in the case of 4 jute samples—2 capsularis and 2 olitorius—are shown below :—

Saponification Value			% Unsaponifiable matter		Iodine value		M. P.
J-795 (olit.)	191	Carbon tetrachloride ext.	25	Carbon tetrachloride ext.	...		
J-1564 (cap.)	140	Alcohol-benzene ext.	37	Alcohol-benzene ext.	24	Alcohol-benzene ext.	
	125	Carbon tetrachloride ext.	28	Carbon tetrachloride ext.	18	Carbon tetrachloride ext.-	72°-73°
J-1825 (cap.)	182	Alcohol-benzene ext.	30	Alcohol-benzene ext.			
	143	Carbon tetrachloride ext.	16	Carbon tetrachloride ext.	...		...
J-1740 (olit.)	155	Alcohol-benzene ext.	38	Alcohol-benzene ext.	...		...
	135	Carbon tetrachloride ext.	20	Carbon tetrachloride ext.			

The percent natural fat and wax removed from the fibre by various treatments are shown below:—

Treatment of fibre	J-1347 (acetone extract)	J-55 (alcohol-benzene extract)
(i) with 0·5% NaOH, fibre/liq. ratio 1: 100, at room temp. for 1 hr.	50	66
(ii) boiled with 1% soda ash, fibre/liq. ratio 1: 25 for 1 hr.	64	66
(iii) boiled with 1% soap solution, fibre/liq. ratio 1:25 for 1 hr.	17	20
(iv) boiled with a mixture of 0·5% soda ash and 0·5% soap solution, fibre/liq. ratio 1:25 for 1 hr.	80	47
(v) with 1% soap solution, fibre/liq. ratio 1:25 at room temp. for 1 hr. ...	Nil	3

This work was done by Dr. H. Chatterjee, Shri A. K. Mazumdar and Shri K. B. Pal.

(*4*) *Deterioration of jute on exposure and in soil burial.*

Further work has been done with jute yarns raw, defatted, solvent-extracted and then treated with batching emulsion, under various conditions. As is natural with such experiments, concordant results are difficult to obtain and a definite conclusion can only be drawn after a very large number of observations have been made. Some of the data so far obtained tend to support the view that the presence of batching emulsion accelerates the deterioration of jute yarn on exposure (*vide* Jute Bulletin, Vol. 12, 1949, p.24) but further work will be necessary to prove this conclusively. It is rather difficult to have identical conditions of exposure which is required for getting reproducible results. Soil burial tests are still more uncertain for obvious reasons. The efficiency of copper,

chemically bound or deposited on the fibre, has been proved beyond doubt by a number of soil burial tests. It appears that the addition of a little iron and chromium to the copper increases the rot-proofing capacity of the latter appreciably.

This investigation is being done mainly by Dr. H. Chatterjee and Shri K. B. Pal.

(5) *Bleaching jute with peroxide, etc.*

The results reported last year have been confirmed by further experiments. Storage trials indicate that the colour resulting from peroxide bleaching is more permanent than that from chlorite treatment. The loss in weight is much less, being mainly due to the partial removal of hemicelluloses by the alkaline liquor, very little lignin being lost during the process. This raises a fundamental issue *viz.*, how far the colour of jute fibre is due to the presence of lignin. It was observed during bleaching with sodium chlorite that the greater the amount of lignin removed, the lighter the colour. The loss in weight during chlorite bleaching is almost entirely due to the removal of lignin. So far as the maintenance of wet strength of bleached jute yarn is concerned, peroxide appears to be no better than chlorite. As is well known, with bleaching powder alone, a full white is scarcely obtainable. If, however, the jute yarn bleached with hypochlorite is treated with dilute peroxide under suitable conditions, much better whiteness is obtained. This is likely to reduce the cost of bleaching to some extent.

The effect of time, temperature, pH, etc., on bleaching with hydrogen peroxide has been studied in some detail. Further work is necessary to confirm some of the results so far obtained. This investigation is being carried out by Dr. H. Chatterjee and Shri K. B. Pal.

(6) *Storage of sugar in jute bags.*

Further work was done with small jute bags at different relative humidities (in desiccators) using a number of antiseptic chemicals. The results indicate the efficiency of monochlorophenol in delaying syrup formation in humid atmosphere, like pentachlorophenol previously reported. To four different relative

humidities (*viz.*, 68, 79.5, 81 and 86%) the sugar bags were exposed; it was generally found that the higher the relative humidity, the quicker the syrup formation. Other chemicals such as Shirlan, borax, benzoic acid, D.D.T. etc., were much less effective than monochlorophenol.

(7) *Torsional rigidity and creep properties of jute filaments.*

The work on torsional rigidity reported last year, has been completed, the results written up and sent for publication. It was done by Dr. K. R. Sen in collaboration with Shri P. R. Mukherjee, Shri S. R. Guha and Shri S. K. Bose. Torsional rigidity modulus was determined for five different jute fibres (two capsularis and three olitorius) both raw and batched, having fairly wide quality ratios. The distribution of rigidity moduli of jute filaments, like that of cotton, is remarkably asymmetrical. The co-efficient of asymmetry is found to range between +0.027 and +0.325, which is somewhat wider than in the case of cotton. The mean rigidity modulus is not appreciably affected by batching, which is rather striking.

The investigation on creep and creep recovery of single filaments of jute was also completed during the year under review and the paper embodying the results obtained sent for publication. This was done by Dr. K. R. Sen and Shri S. R. Guha. Changes on loading and unloading, the primary creep and the creep recovery of single filaments of jute—wet and dry—were determined by direct observation. A considerable lag between the instantaneous extension and contraction has been observed on loading and unloading a wet jute filament. While the recovery from creep in air dry condition is quick, that in the case of wet filaments shows a large lag. The creep of filaments under load appears to bear a linear relationship with the logarithm of duration of loading, other conditions remaining unaltered.

(8) *Frictional characters of jute fibre.*

The study of static frictional characters of jute with a modified apparatus was continued throughout the year by

Shri S. B. Bandyopadhyay. Further results obtained with defatted (solvent extracted) fibre confirm the conclusion drawn last year, *viz.*, that solvent extraction increases the co-efficient of friction. The co-efficient of friction and the nature of slip were determined in the case of some other vegetable fibres, using the same method. Flax and sunn hemp, it has been found, have more or less the same co-efficient (*viz.*, about 0.5) as jute, but for mesta, ramie and altissima the values were much higher (between 0.6 and 0.7). This would suggest a lower twist for spinning the latter. Increase in pressure on the jute pads somewhat lowered the co-efficient of friction upto a certain limit beyond which the effect of pressure was practically nil. The influence of relative humidity on the co-efficient of friction was further investigated and it was found that an approximately linear relationship exists between the two. Roughly speaking, for rise of 1% in relative humidity (the range of R.H. being 45 – 80%) the co-efficient of friction increases by 0.005.

The mean figures for the co-efficient of friction of four jute samples at different stages of spinning show that at three subsequent stages the values are higher than with the raw fibre. But after extraction of the *same* bundles with alcohol-benzene, the order is reversed.

Co-efficient of friction

Stages	Raw	Batched	Sliver	Rove
Condition				
(1) Before extraction ...	0.40	0.46	0.45	0.43
(2) After extraction ...	0.55	0.54	0.52	0.51
(3) Decrease due to natural fat and wax ...	0.15	...	...	...
(4) Increase due to emulsion alone (1) – (2) + (3) ...	...	0.07	0.08	0.07

The figures in the second horizontal row indicate the effect of gradual splitting up of the strands during the course of manufacture while those in the first row, show the combined effect of batching emulsion, natural fat and wax as well as splitting. The individual effects are shown in the last two rows.

These lend further support to the view expressed last year, *viz.*, that batching emulsion increases the friction between fibre pads but does not appear to lubricate the fibre strands. Further work to elucidate this point is in progress, but from the results so far obtained it seems that the water present in the batching emulsion is mainly responsible for this increase in friction, the contribution of oil being comparatively less.

III. ROUTINE SPINNING TRIALS

(*i*) *Test on Jute Agricultural Research Institute Samples.*

Eighty-seven samples of the 1948 crop, received late last year, were spun and tested in the usual manner this session. The results are shown below in tabular form. Such results are usually ready rather late and so are not generally available before planning for the next crop. This was considered unsatisfactory and arrangements were made with the Director, Jute Agricultural Research Institute for sending the samples for test to these Laboratories as soon as ready and top priority was given to this important work in Technological Research Laboratories so that results could be made available to Jute Agricultural Research Institute *before* the next sowing time. This has been done and the results of the eighty Jute Agricultural Research Institute samples received during the year (1949-50) were sent in two lots in January and March 1950. These are also summarised below.

TABLE I

J. A. R. I. 1948 crop *Quality ratios of 10 lb. yarns*
Line vs. Broadcast sowing

Treatment	Chinsurah Green	D 154
Lines 12″ apart, no thinning ...	74	87
2″ × 12″ ...	78	87
3″ × 12″ ...	75	90
4″ × 12″ ...	70	81
Broadcast ...	75	91

With Chinsurah Green, the quality falls as spacing is increased, 4″ × 12″ spacings appear to be unsuitable for both.

The results with Altissima are noted in Table II.

TABLE II

J. A. R. I. 1948 crop *Quality ratios of 10 lb. yarns*
Line vs. Broadcast sowing

Stage of harvesting	Spacing									
	No thinning × 12″		2″ × 12″		4″ × 12″		6″ × 12″		Broadcast	
	Q.R.	Wt. C.V	Q.R.	Wt. C.V.	Q.R.	Wt. C.V.	Q.R.	Wt. C.V.	Q.R.	Wt. C.V.
Bud ...	92	22	90	22	82	22	73	28	90	21
Flower ...	78	31	75	29	75	30	80	25	72	27
Pod ...	71	30	75	26	68	26	69	30	73	3

Q.R. stands for quality ratio (breaking load lb/grist) and Wt. C. V. indicates regularity of the yarn.

Generally speaking, the best quality of fibre is obtained if harvested at the bud stage. It is worth seeing if the same results are obtained on repetition. In the case of jute, a summary of six years' figures leads to no definite conclusion (*vide* p.12, Technological Research Laboratories Annual Report for 1946-47). The effect of spacing also seems to be more or less similar to that in the case of jute—the quality usually suffers with greater spacing. Rosella and jute behave practically in the same manner in these respects.

TABLE III

Manurial Trials 1948 — *Quality Ratios of 10 lb. yarns*

Treatment	D 154	Chinsurah Green
N_1	74	64
N_2	71	58
N_3	74	57
K_1	82	71
K_2	81	74
K_3	85	71
N_1K_1	76	67
N_1K_2	79	62
N_1K_3	72	63
N_2K_1	76	60
N_2K_2	73	61
N_2K_3	75	62
N_3K_1	69	57
N_3K_2	72	59
N_3K_3	69	58
F Y M	79	76
S_1	81	89
S_2	83	78
S_1N_1	76	79
$S_1N_1K_1$	72	74
C_1	78	73
C_2	80	60
C_1N_1	73	63
$C_1N_1K_1$	73	65
F Y M_1	81	82
F Y M_2	80	79

Potash manuring seems to have a better effect on quality of the jute produced, both capsularis and olitorius. Farm yard manure is very efficient indeed compared to compost.

TABLE IV

J. A. R. I. 1949 crop

Manurial Trials Treatment	*Quality ratios of 10 lb. yarns* D 154	Chinsurah Green
N_1	84	87
N_2	82	67
K_1	72	88
K_2	87	89
N_1K_1	82	71
N_1K_2	70	81
N_2K_1	68	78
N_2K_2	77	70
Compost	79	73
Sludge	85	86
F Y M	82	84
No manure	87	91

The results are somewhat conflicting, 'no manure' plots apparently yielding jute of the best quality. These quality figures can only be properly interpreted with the yield per acre. Combination of nitrogen and potash seems to be unsuitable as regards quality of the fibre produced.

TABLE V

J. A. R. I. 1949 crop

Manurial Trials Treatment	*Quality ratios of 10 lb. yarns* D 154	Chinsurah Green
Compost single dose	90	84
,, double ,,	93	80
Sludge single dose	92	91
,, double ,,	94	89
F Y M single ,,	98	91
,, double ,,	96	89
Ammon. sulph. 20 lb.	92	90
,, ,, 40 lb.	91	89
,, ,, 60 lb.	100	87
No manure	98	87

Here again, the yield per acre should presumably be the decisive factor in choosing a particular manure inasmuch as the differences in quality figures are not appreciable. Farm yard manure appears to be as good as chemical fertiliser.

TABLE VI

J. A. R. I. 1948 crop *Line vs. Broadcast sowing*

Quality ratios of 10 lb. yarns

Treatment	D 154	Olitorius (039-620)
Broadcast	73	105
Light thinned	73	102
2″ × 12″	73	104
3″ × 12″	73	101
4″ × 12″	74	97

While the effect of wide spacing on quality is somewhat manifest in the case of olitorius jute, the results lead to no definite conclusion in the other case.

TABLE VII

Effect of date of sowing on plant growth, etc.

J. A. R. I. 1949 crop *Quality ratios of 10 lb. yarns*

Date of sowing	D 154
March 16, 1949	61
April 1, 1949	68
April 16, 1949	72
May 1, 1949	90
May 16, 1949	98
June 1, 1949	92*
June 16, 1949	79*
July 1, 1949	68*

*Quantity too small for spinning, the fibre was tested.

Effect of early or late sowing on quality is apparently the same, so far as these results are concerned.

TABLE VIII

J. A. R. I. 1949 crop *Quality ratios of 10 lb. yarns*

Triple cropping

(Capsularis Jute—Paddy—Barseem)

	Manured		Not manured
A	81	A	75
B	85	B	77
C	69	C	64
D	78	D	74
E	81	E	83
F	75	F	68
Mean value—78		Mean value—73	

(Olitorius Jute—Paddy—Barseem)

A	88
B	95
C	77
D	85
E	88
F	93

Mean value—88

The manured plots under triple cropping yield a somewhat better quality of fibre.

(ii) Murshidabad Jute Samples.

Before the partition of India, most of the West Bengal jute was exported, Calcutta mills using mainly jute from what is now called Pakistan. It became necessary therefore to examine West Bengal jute to assess its quality so that proper use could be made of it in our jute mills by judicious choice. Early last year, at the suggestion of Mr. I. G. Kennedy, Vice-President, Indian Central Jute Committee, this work was undertaken and

so far 30 commercial samples from the Murshidabad district have been tested. The results which are expected to be useful to the industry, are shown below.

Ref. No.	Station	Variety and grade	Quality ratios of 10 lb. yarns	% Cuttings removed before spinning
J-2145 ...	Cossimbazar	Olit. middle	105	2·97
J-2146 ...	,,	,, bottom	89	2·98
J-2147 ...	,,	,, ,,	101	3·7
J-2148 ...	Beldanga	,, middle	99	7·18
J-2149 ...	,,	,, ,,	86	Nil
J-2150 ...	,,	,, bottom	90	Nil
J-2151 ...	,,	,, ,,	85	2·94
J-2152 ...	Jiaganj	Caps. middle	89	10·49
J-2153 ...	,,	,, bottom	84	10·56
J-2154 ...	,,	Olit. middle	89	10·16
J-2155 ...	,,	,, bottom	82	10·16
J-2156 ...	,,	,, middle	93	5·9
J-2157 ...	,,	Caps. bottom	79	11·11
J-2158 ...	,,	Olit. bottom	70	5·28
				7·51
J-2187 ...	Lalgola	,, middle	87	
J-2188 ...	,,	,, bottom	90	7·14
J-2189 ...	,,	,, middle	96	9·83
J-2190 ...	,,	,, bottom	78	17·04
J-2191 ...	,,	Caps. ,,	76	21·1
J-2192 ...	,,	,, middle	77	9·12
J-2253 ...	,,	,, bottom	76	21·05
J-2254 ...	,,	,, middle	67	11·72
		,, bottom	88	19·54
J-2229 ...	Dhulian	Olit. middle	102	6·47
J-2230 ...	,,			
J-2231 ...	,,	Caps. bottom	84	13·59
J-2232 ...	,,	,, middle	72	15·21
J-2233 ...	,,	Olit. bottom	99	15·58
J-2234 ...	,,	Caps. middle	88	13·61
J-2235 ...	,,	Olit. ,,	97	7·76
J-2236 ...	,,	,, bottom	94	15·25

(iii) Madras Jute Samples.

Eight samples of jute grown in Madras were received from the Manager, Agriculture College Farm, Ponnur (Macheverum) in December last, the results of tests on these are given below.

Ref. No.	Variety	Wt. received (lb)	Quality ratio of 10 lb. yarn	% cuttings removed before spinning
J-2221 ...	Olit.	10	87	Nil
J-2222 ...	Caps.	14¼	103	8.74
J-2223 ...	Chinsurah green	12	97	2.45
J-2224 ...	D154	11	96	Nil
J-2225 ...	Olit.	10¾	91	Nil
J-2226 ...	Caps.	11	106	Nil
J-2227 ...	Chinsurah green	10¼	101	Nil
J-2228 ...	D154	10	105	Nil

It may be noted that the fibres produced in Madras are mostly of high quality.

IV. SUBVENTION FARM TRIALS, 1949

During the year under review 129 samples of jute grown at different Subvention Farms under the auspices of the Jute Agricultural Research Institute were spun and tested. Of these, 48 were from Orissa, 50 from West Bengal, 23 from Behar and 8 from Assam. The results were all communicated to the Director, Jute Agricultural Research Institute, in January and March, 1950 so that they may be utilised in the next set of trials.

V. TESTS ON COMMERCIAL FIBRE SAMPLES

Only a limited number of these samples have recently been possible to obtain; some more are expected. The tests on these will be started shortly. Attempts are being made to procure through the Indian Jute Mills Association representative samples from some centres from which there are technical difficulties of despatching small jute samples to Calcutta.

VI. SUBSTITUTE FIBRES

The most important work on jute substitutes, done during the year, was on samples of linseed fibre received from the Principal, Harcourt Butler Technological Institute, Kanpur. These were

Ref. No.	*Description*
S. R. 183	Fully retted, hand extracted and hand cleaned
S. R. 184	Half retted, Windrum Machine extracted and hand cleaned
S. R. 185	Unretted, Windrum Machine extracted and hand cleaned
S. R. 186	Unretted, Windrum Machine extracted but not cleaned

Mill middle-grade jute (J-1658), bottom grade jute (J-796) or jute cuttings were mixed with some of these linseed fibre in varying proportions and spun on the jute machineries. S.R. 183 was quite soft and no batching emulsion was added to it. Some modifications in procedure were necessary for successfully spinning these samples. The details are expected to be published shortly. The yarns were woven into sacking cloth (using two particular mixed yarns as warp), 20″ wide, and made into a number of sample bags. The effect of linseed fibre was scarcely noticeable in the warp yarns which contained 30% of linseed fibre by weight. Weft yarns with S. R. 183 and S. R. 184 were quite good but those with S. R. 185 and S. R. 186 contained much shives. Gunnies made of these latter wefts could be used for other purposes than storing food stuffs, etc. The bags were fairly attractive and contained anything between 10 and 74% linseed fibre, the rest, of course, was jute. Some of the important results are noted below:

TABLE I

Results of spinning Linseed Fibre

% Composition	Droppings (%)		T. P. I.	Grist	Wt. C. V. (%)	Q. R.	No. of yarn Breaks	Remarks	Yarn Ref.
	At Breaker	At Finisher							
S. R. 184 (30) J-1658 (70) ...	3·2	1·6	3·43	9·9	23·8	70	20	Spun smoothly	LY 2852
S. R. 183 (30) J-1658 (70) ...	1·4	0·8	3·43	10·3	28·8	59	7	do	LY 2854
S. R. 183 (100) ...	1·4	2·9	3·43	15·6	29·5	44	12	Did not spin well	LY 2855
S. R. 185 (100) ...	8·1	3·9	2·65	34·8	23·6	45	3	Much shives in yarn	LY 2856
S. R. 185 (70) J-795 (30) ...	8·7	7·5	2·37	40·5	17·1	50	2	Spun smoothly	LY 2859
S. R. 184 (70) J-796 (30) ...	7·6	6·8	2·37	34·8	14·6	58	nil	do	LY 2860
S. R. 184 (70) J. 796 (30) ...	7·2	7·4	2·37	26·7	19·8	60	nil	do	LY 2861
S. R. 183 (100) ...	1·3	3·0	2·65	37·9	23·9	59	3	do	LY 2866
S. R. 185 (35) Jute cutting (35) J-796 (30)	6·5	2·6	2·37	40	...	50	1	do	LY 2848
S. R. 186 (70) J-796 (30) ...	6·5	1·8	2·37	39	...	46	nil	do	LY 2849

T. P. I. stands for turns per inch (twist)
Q. R. „ „ quality ratio.

TABLE II

Composition of fabrics made of linseed fibre and jute

Ref. No. of fabrics	Warp	Weft	Porter	Shots	Weight per yd.* (28" wide) in oz.	Total linseed fibre in sacking (%)
I ...	LY2854	LY2855	7½	9	16	74
VII ...	LY2852	LY2855	7½	9	14½	74
VI ...	LY2854	LY2860	7½	8	15	55
VIII ...	LY2852	LY2860	7½	9	14.2	55
V ...	LY2854	LY2848	7½	8¾	18	33
XI ...	LY2852	LY2848	7½	8½	17	33
IX ...	LY2852	LY2849	7½	9	16.3	55
III ...	LY2854	LY2849	7½	8½	16.4	55
IV ...	LY2854	LY2859	7½	8½	17	55
X ...	LY2852	LY2859	7½	8½	18	55
XII ...	LY2852	Jute yarn	7½	8½	16.4	10
VI ...	LY2854	Jute yarn	7½	8½	17.2	10
XIII ...	Ordinary	Jute yarn	7½	7⅓	15 3	100 (Jute)

*Calculated from 20" wide fabric for comparison.

In view of the fact that various substitute fibres are now being used in the Indian jute mills for want of jute, a circular letter was issued through the Director, Indian Jute Mills Association Research Institute to the member mills for sending such samples for tests in the Technological Research Laboratories. 28 samples have so far been received in response to this letter; these are being spun under different proportions and conditions. The results are expected to be ready shortly.

VII. CO-OPERATION WITH THE INDUSTRY

A circular letter was issued to a large number of jute mills requesting them to send specific problems, if any, for tackling in Technological Research Laboratories with the facilities available. A few responded. Manager was deputed to one of the mills outside Bengal for giving technical advice. The mill

authorities highly appreciated the service thus rendered. Some mills made enquiries about certain of their problems; replies were given to them in due time. To assist the industry in the matter of making judicious use of jute substitutes, a fairly large number of samples, as already mentioned, are now being spun, blended with jute, under different conditions. It is expected that the results and experience would be useful to the mills. At the request of a Calcutta Jute Mill, the possibilities of using Cantala fibre (a hard leaf fibre) as jute substitute were explored rather exhaustively and a comprehensive report sent thereon. Representatives from a C.P. Jute Mill, had discussion on some technical matters with the writer, and requested for a sample of *jangli* jute to be tested. This has been complied with.

Eighteen technological research leaflets were prepared by the former Director, Technological Research Laboratories, printed and liberally distributed amongst the officers of jute mills through the Indian Jute Mills Association. In these are described some of the important matters relating to the science and technology of jute in a popular way. More are expected to follow in course of time.

VIII. MISCELLANEOUS WORK

A soft bast fibre, more or less similar to jute, was sent for examination with a view to seeing if it could be used for jute, by a private party from Malabar. This was duly tested and the results reported. A number of jute substitutes from different parts of the Republic were received for test during the year. These were mostly too small for a spin and were therefore tested in the fibre form. Five samples of fibre, twine and rope were received from the Prince of Wales Military College, Dehra Dun for test. Two lots of bleached jute yarns impregnated with synthetic resins were received for test from Dr. J. K. Chowdhury, who is operating a scheme of research subsidised by the Indian Central Jute Committee.

IX. INFORMATION

The number of books and pamphlets added to the Library during the year under review was 224. A separate bibliography of the science and technology of jute, for ready reference, from the literature available in Technological Research Laboratories Library was started some months ago and is expected to be complete shortly; the existing scattered index cards were utilised for the purpose. 63 scientific journals, mostly relating to textile and fundamental science, are subscribed yearly; a few are obtained in exchange. 195 volumes of books including journals were bound during the year. Attempts were made to procure back issues of some important journals. The indexing and abstracting of scientific papers proceeded as usual. The literature on chemical retting was also surveyed.

X. PUBLICATIONS

(1) Chakrabarti, B. K. & Nodder, C. R.
Some effects of the helical fibrillar structure of vegetable fibres. *Nature*, 1949, *163*, 19.

(2) Nodder, C. R.
Sacking weft yarns. Jute Bull. 1949, *11*, 438.

(3) Nodder, C. R.
Batching oil and yarn strength. *ibid*, 1949, *12*, 23.

(4) Chakrabarti, B. K.
A quick and simple method of obtaining the mean and its standard error and the co-efficient of variation in textile tests with special reference to the measurement of yarn strength. J. Textile Inst. 1949, *40*, p. 370.

(5) Sen, K. R.
Some factors affecting test standards for jute. I. S. I. Bull. 1949, *1*, p.63.

(6) Sen, K. R.
Physical methods of testing jute fibre. Sci. & Culture. 1949-50, *15*, p.210.

(7) Sarkar, P. B.
Chemical retting of jute. Jute Bull. 1945-50, 12, p.427.

(8) Chakrabarti, B. K.
The effect of variations in grist and twist on the strength of the yarn. Indian Textile J. 1948-49, *59*.

(9) Chakrabarti, B. K.
The bulk torsional rigidity of jute and its relation to spinning quality. Indian Textile J. 1949-50, *60*, p.319.

(10) Sarkar, P. B. & Mazumdar, A. K.
Hygroscopicity of Jute fibre. Sci. & Culture, 1949-50, *15*, p.328.

(11) Sen, K. R.
Necessity of reoriented outlook on fundamental researches on jute. Jute Bull. 1949-50, *12*, p.585.

(12) Sen, K. R.
Quantitative relation between yarn and fibre properties. Current Science, 1950, *19*, p.106.

(13) Sen, K. R.
A method for comparing the relative quality of jute yarns. Sci. & Culture. 1949-50, *15*, p.384.

(14) Nodder, C. R.
A Review of the Position reached in Technological Research on Jute.

XI. VISITORS

The following are some of the visitors who came to see the Laboratories during the year:

His Excellency Dr. K. N. Katju	...	Governor of West Bengal.
Dr. Arthur E. Morgan	...	Member, University Commission for India; formerly of T. V. A. of the U.S. A.
Shri C. C. Biswas	...	Vice-Chancellor, Calcutta University, now Minister, Government of India.
Sardar Datar Singh	...	President, Indian Central Jute Committee.
Hon'ble J. N. Panja	...	Minister, Government of West Bengal.
Mr. Eugenio E. Cruz	...	Bureau of Plant Industry, Manila.
Shri H. P. Chatterjee, M.L.A.		Member, L.S.C., Indian Central Jute Committee.
,, K. M. Das	...	Member, L.S.C., Indian Central Jute Committee.
Mr. Cleveland B. Mcknight	...	Vice-Consul, U.S.A.
Dr. Hung Chang Yin	...	UNESCO
Shri P. D. Maskara	...	Mahabir Jute Mills.
,, P. D. Bangur	...	Hastings Jute Mills.
,, K. W. Sarawogi	...	Raigarh Jute Mills.
Mr. Miguel Low	...	Buenos Aires.
,, Brian L. G. Beeson	...	London.
,, R. B. Hill	...	Fairbairn Lawson Combe Barbour Ltd.

XII. GENERAL

Equipments :

The Pegg hank dyeing machine, complete with motor, etc. has just been received from the U.K. It is to be used in the chemical technology block where work is expected to start shortly. For the same section, order has been placed with an Indian firm for a small resistant tank of monel metal. The twisting frame, ordered some time ago, has also been received. An electric moisture meter from the U.S.A. is expected to arrive shortly.

Science colloquium :

To discuss scientific matters, with special reference to jute research, a Science Colloquium was started in these Laboratories in September last year. Monthly meetings are being regularly held and talks given on various subjects. The scientific staff of the Laboratories are participating in this.

Increased work :

With the 'Grow More Jute' campaign in the Indian Republic, work in the Spinning and Testing Sections has increased very considerably as will be evident from the figures given below. Every attempt was made to cope with the situation by utilising to the fullest extent the man-power and equipment available. With the existing staff, it is very difficult to manage and a few new hands seem indispensable.

Year : (Jan.-Dec.)	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Total no. of samples tested in the Testing Section.	254	360	449	630	668	644	539	450	479	388	830

Year: (July-June)	Total no. of spins done (all kinds)	Year: (July-June)	Total no. of spins done (all kinds)
1938-39	147	1944-45	191
1939-40	241	1945-46	301
1940-41	229	1946-47	262
1941-42	403	1947-48	149
1942-43	253	1948-49	189
1943-44	209	July '49-May '50	369

A peaceful and cordial atmosphere prevailed in these Laboratories throughout the year and all members of the staff—irrespective of the position held—tried to give their best. But for this whole-hearted co-operation, it would be impossible to achieve the results briefly reported in the foregoing pages. I take this opportunity of placing on record my grateful thanks to all my colleagues for their ungrudging help.

सत्यमेव जयते

P. B. SARKAR,
Director.

May 27, 1950.

Subject	Progress	Future work
11. Background Research.	(1) Half of the hemicelluloses present in jute fibre has been isolated and examined. Its composition has been ascertained and properties studied. The other half is being studied.	(1) The alcohol-soluble portion is to be examined thoroughly in a similar way.
	(2) Effect of storage on the strength of chlorite bleached jute yarns has been studied over a period of more than 2 years. The loss in strength does not appear to be appreciable even after $26\frac{1}{2}$ months.	(2) A similar experiment with peroxide bleached yarn may be done.
	(3) Jute fat and wax have been subjected to a preliminary examination. It appears that these have saponification value varying between 125—190 and a low iodine value. The unsaponifiable matter is fairly high.	(3) Further work may continue.
	(4) Deterioration of jute yarns on exposure and in soil burial has been investigated. The presence of batching emulsion appears to accelerate the loss in strength on exposure. A little iron and chromium added to copper results in increased protection of jute yarn.	(4) More tests should be done to confirm the results.

(5) Bleaching of jute with hydrogen peroxide has been carried out under different conditions. The loss in weight is quite small and is mainly due to the removal of hemicelluloses by the alkaline bleaching liquor. The loss in wet strength is more or less of the same order as with 'Textone' but afteryellowing of the bleached sample proceeds much more slowly. 'Mixed bleaching' seems to be an advantage, as regards cost.	(5) The work may continue.
(6) Some more antiseptic chemicals have been tried to delay the syrup formation from sugar stored in jute bags in humid atmosphere. Monochlorophenol appears to be quite promising.	(6) More chemicals (non-toxic to man) may be tried.
(7) Torsional rigidity and creep properties of single jute filaments have been studied, the results written up and sent for publication. The distribution of rigidity moduli is notably asymmetrical and the mean value appears to be practically independent of batching. A considerable lag has been observed between the instantaneous extension and contraction on loading and unloading a wet jute filament. Other conditions	

Subject	Progress	Future work
	remaining the same, the creep of filaments under load appears to bear a linear relation with the logarithm of duration of loading.	
	(8) Further investigations have been carried out on the frictional characters of jute fibre. That solvent extraction increases the co-efficient of friction has been confirmed. Frictional properties of some other vegetable fibres have also been studied; mesta, rosella and ramie appear to have a much higher co-efficient of friction. It has been found that an approximately linear relationship exists between the co-efficient of friction and the relative humidity.	(8) Further work on the subject is desirable.
III. Tests on J. A. R. I. Samples.	87 samples of 1948 crop, received late last year, as well as 80 new samples received during the year were tested and the report sent before the next sowing time. These include manurial trials, experiments on spacings, line *vs.* broadcast sowing, etc. While some of the results are fairly conclusive, others are not so.	Further samples may be tested as required.

IV. Tests on Murshidabad Samples.	30 commercial jute samples from five centres in Murshidabad were spun and tested for quality. The results indicate that the fibre is mostly of high quality.	Other samples, if available, may be tested.
V. Madras Jute Samples.	Eight samples of jute grown in Madras were received for test. The results show that all the samples were of high quality.	Further samples to be tested, if required.
VI. Subvention Farm Trials.	Altogether 129 jute samples from 1949 subvention farm trials were spun and tested.	Further samples to be tested, if required.
VII. Tests on Commercial Samples.	Samples, except those from Murshidabad, were received late in the year. These are to be spun and tested shortly.	The work is to continue.
VIII. Substitute Fibres.	Four samples of linseed fibre received from Harcourt Butler Technological Institute, Kanpur, were spun alone or mixed with jute in suitable proportions and the yarns made into sacking cloth in a Calcutta mill. The results are encouraging and indicate the possibility of using a fairly large proportion of such fibre with jute in making gunnies.	Further work is to be done on this item.
IX. Fibre Character and Spinning Quality.	Little work on this item could be done; a new plan of work is under consideration.	Further work will be necessary.

Subject	Progress	Future work
X. Moisture Relationship.	A moisture meter is expected shortly from California, which is to be used for this work as soon as received.	
XI. Chemical Retting.	As the appointment of a sanctioned hand for this work could not be made, work on this item was not possible to start. Up-to-date literature on the subject has been collected.	Work should be started as soon as possible.
XII. Collection of Information.	Work has proceeded on usual line. A separate bibliography on the science and technology of jute has been completed.	This work is to continue as before.
XIII. Miscellaneous.	A number of samples of long vegetable fibres were tested for private parties in order mainly to see if these could replace jute. Dr. J. K. Chowdhury's resin-impregnated samples were tested.	Work on this heading is likely to continue.

APPENDIX III

ANNUAL REPORT OF THE ECONOMIC RESEARCH SECTION FOR THE YEAR 1949–50

During the year under review Mr. K. C. Basak, Director of Economic Research, was in charge of the Economic Research Section. The volume of work of the section increased considerably, particularly on account of a number of surveys undertaken with a view to studying the marketing and transport problems of jute.

The sanctioned programme of work of the Section for the year 1949-50 was as follows:—

(*i*) Investigation into the economics of jute growing.
(*ii*) Study of mofussil prices of jute and other statistics.
(*iii*) Jute substitutes.
(*iv*) Statistical analysis of the data on physiology of jute.
(*v*) Revision of Marketing Reports.
(*vi*) Survey of transport conditions.

Besides carrying out the programme for 1949-50, good progress was also made in some of the items of the programme for 1950-51 which was sanctioned by the Committee at its meeting held in January, 1950.

A summary of work done during the period under review is given below:—

INVESTIGATION INTO THE ECONOMICS OF JUTE GROWING

(*a*) *Investigation in 1949-50.*

In the second year of our investigation in the Indian Union, the study was carried out in five centres, of which four were the same as in 1948 while the fifth centre in Assam was shifted from Rupohi to Nowgong for facilitating the smooth working of the enquiry. The number of farms investigated at each of the centres was 40 as before except at Kendrapara where the number was 35. Most of the farms being the same as before, very little of preliminary survey work was necessary in 1949 except in the new centre at Nowgong. In the other centres, however, a few farms had to be changed for want of proper co-operation from

their owners. It was only in respect of these farms and also six additional farms at Kendrapara that a fresh plot survey was necessary.

The general economic survey of the villages of our investigation was intensified and the information collected in 1948 was verified in all its details and supplemented wherever necessary. A fresh survey was, however, undertaken at Nowgong as it was a new centre. At Monoharpur also a fresh survey was done for some items of information, details of which were lacking in the previous year's survey report. The monthly income and expenditure of the farmers, both on their personal account and the farming account, apart from being made more elaborate, were collected on a weekly basis. Attempt was also made to strike a balance between income and expenditure at definite intervals so as to reduce the over-estimation or under-estimation at the year end as, it might be recalled, was experienced in our last report. Thus, in the light of our growing experiences of field work in different economic environments attempt was made as far as possible to improve the technique with the necessary flexibility for its adjustment to different economic situations.

In respect of other items also much improvement has been made, because, our investigators were in 1949 doing their second year's work and had in consequence a surer knowledge of the circumstances that governed the cultivation of jute and other crops in their respective areas.

A comprehensive report of the investigation has been prepared which will be placed for the consideration of the Committee at its meeting to be held in July next. A special feature of this year's report is a separate analysis of the cost of production of jute for plots taken on share-rent basis. Some of the important conclusions drawn from the investigation on jute are summarised below :—

(*1*) Cost of production for share-rented plots was considerably higher than that for cash-rented plots, which was mainly due to the high rent paid for the former plots by way of half share of the crop.

(*2*) While the accounts of the average farmer in all the five centres of investigation showed net profit on jute, share-rented plots showed net loss.

(*3*) Of the total cost, only a little less than a half had to be incurred in cash (*i.e.*, paid cost) which shows that large-scale jute cultivation requires cash money and can be undertaken only by big farmers. For the share-croppers, of course, paid cost was very little, because they took only that much of land which they could manage by their own labour and meagre financial resources.

(*4*) Manure accounted for only 3% of the total cost which, though showed an increase over last year, is still inadequate and much scope lies in improving the yield by the application of more manures.

(*5*) About 80% of the operational cost was human labour cost of which about 55% was hired. Therefore, the availability of labour is very important for which family labour is not sufficient. Labour saving devices such as the use of wheel hoes for weeding (which alone requires about 40% of total labour) will go a long way to solve the problem of labour shortage for increasing jute cultivation.

(*6*) A preliminary enquiry was undertaken to find out what the growers did with the money they realised from the sale of their jute. It has been noticed that the majority of the growers, who have small holdings, sell their jute within a short period of harvesting crop and with the money thus realised buy rice and paddy for their own consumption. Thus in the case of the majority of the jute growers, the high price of paddy or rice has a tendency to offset the benefits of high price of jute. Under these circumstances the small grower is hardly left with any surplus cash which is essential for financing the production of a larger crop of jute next year. This severe limitation on the financial resources of the majority of the growers make them easy victims of usury and *dadan* system and also puts a limit to the scope of expansion of jute acreage. This aspect of the problem of jute growing has been taken up for further study and necessary data and information are being collected.

(b) Investigation in 1950-51.

Collection of data for the late operations as also for yield of jute and paddy for the last season was continued up to March. With the beginning of the new jute season, the investigation was as usual taken up in all the old centres. The proposal made earlier by the Committee to shift the Monoharpur centre to Sahebnagar in Tehatta, had to be dropped due to want of accommodation in the proposed centre. A few of our old farmers having left the centres due to recent disturbances. some difficulty was experienced at Belakoba, Nowgong and Monoharpur. But some of them have of late returned and for the rest we had no other alternative but to change the farms and select some other farms of similar sizes as far as were available.

In pursuance of the decision of the Committee to make a detailed study of share-croppers, a number of pure share-croppers have been included in our sample in each of the five centres under investigation.

INTRODUCTION OF IMPROVED METHODS OF CULTIVATION

The Committee at its meeting held in July 1949 directed that improved methods of cultivation evolved by the Jute Agricultural Research Institute should be tried out under cultivator's condition in the five centres of investigation. Accordingly, a plan was drawn up in consultation with the Director, Jute Agricultural Research Institute, to give effect to the above decision of the Committee.

Preliminary propaganda was made among our selected farmers and some of them agreed to apply the improved methods in a few of their jute plots. In each centre, therefore, we have chosen a few plots for the introduction of improved methods of cultivation as also a few others where the traditional method would be pursued. Our intention, besides demonstration of better methods, is to study and compare the cost of production of jute under these two methods. Relevant data are being regularly collected and the whole work is being supervised by our mofussil staff under the technical direction of the Director, Jute Agricultural Research Institute.

Some difficulties have been experienced in introducing the new methods, among which the following are the most important:—

(*1*) Line sowing by hand has been found to be generally unpopular with the cultivators as the amount of labour and time required for this operation is considerably more than that required for broadcast sowing. Further, it will add to the cost of production and thereby reduce the benefit to be derived from lower cost in weeding operation done by wheel hoes.

It, therefore, appears that the use of seed drills is imperative for the success of the scheme. Without such drills the cultivators would not readily take to the new methods, nor would it be possible to reduce the cost of production of jute substantially.

(*2*) Compost was available only at two centres out of five. In one centre, namely, Belakoba, the cost of transport for carrying compost from Jalpaiguri to Belakoba was particularly heavy which will add to the total cost of production.

Some technical difficulties of a local nature have also been experienced. Detailed reports about these are being collected.

STUDY OF MOFUSSIL PRICES OF JUTE AND OTHER STATISTICS

Data regarding arrivals, grade outturn, price etc. for jute and price data for paddy and rice were collected from the five centres of investigation during the period under review. Analysis was carried out of the relative movement of the prices of jute and rice and the results were regularly reported to the monthly meetings of the Local Sub-Committee.

A special investigation was undertaken to estimate the parity prices of jute at the five centres of investigation. For this purpose detailed information on the various charges of the mofussil balers was collected.

A detailed report on the scheme has been prepared which will be placed for the consideration of the Committee at its next annual meeting.

STUDY OF AMERICAN MARKET FOR JUTE GOODS

The effect of devalution of the rupee on prices of jute goods in the U.S.A. has been investigated and a brief report on the subject was considered by the Committee at its last meeting held in January, 1950. The position in the post-devaluation period may be summed up as follows :—

Prices of jute goods in the U.S.A. rapidly increased soon after devaluation as may be seen from the following table :—

New York Spot Prices of 10oz. 40" Hessian.

1949	Price (cents per yd.)	1950	Price (cents per yd.)
July ...	15·7	January ...	19·2
August ...	17·1	February ...	18·8
September ...	17·1	March ...	17·7
October ...	16·8	April ...	17·0
November ...	18·4		
December ...	19·1		

On the basis of Calcutta ceiling prices the equivalent New York prices should be 15.9 cents per yard. But after devaluation, since October, 1949, actual prices in New York ruled above the equivalent ceiling prices. The highest level in prices was touched in January 1950 when the difference between actual and ceiling prices was more than 3 cents per yard, that is the market prices in New York were nearly 20% more than the equivalent ceiling prices. Prices moved downwards since February 1950, but even in April, the month for which latest quotations are available, prices were at the pre-devaluation level.

It is clear, therefore, that the reduction of prices of jute goods in U.S.A., which was expected as a result of devaluation, did not materialise. One major cause for this is that while prices are controlled in India, in the U.S.A. the market is absolutely free and the favourable margin in price created by devaluation has been wiped off by the trade operating at the other end, so that American consumers of jute goods have been paying as much as and even more than what they were paying before devaluation. The basic cause, however, is no doubt the shortage of jute goods against current demand.

The rise in dollar prices of jute goods is undesirable for two reasons. In the first place, though jute goods are now earning dollars practically at the pre-devaluation rate, the traders at the American end are making a higher margin of profit at the cost of India's dollar earnings. Secondly, high prices are likely to reduce the consumption of jute goods in the long run and bring in substitutes in their place, although India herself is selling jute goods at cheaper rates in terms of dollar. This is the more serious aspect of the current situation in the U.S.A. The only plausible corrective from India's end appears to be a further increase of exports of jute goods to the U.S.A.

The position regarding the supply of jute goods to the U.S.A. has been studied in some detail. The shipment of hessian from India to the world declined in 1949 by 16% as compared with 1948, the shipment to North America showing the same percentage decline. As against this reduction in supply, U.S. consumption of hessian in 1949 declined by about 10%. In the pre-war period, the U.S.A. consumed about 47.5% of total world shipment of hessian from India, but in the post-war period the share of the U.S.A. rose to 54% and in 1949 it was 56.1%. In absolute terms, of course, U.S. consumption of hessian steadily declined from 900 million yards in 1946 to 800 million yards in 1949, but the latter figure was higher than the pre-war average of 732 million yards per year. It is also significant that between 1946 and 1949 shipment of hessian from India to the world fell from 1600 to 1400 million yards and to North America from 1150 to 827 million yards. Of the total

shipment of hessian to North America, the share of U.S. consumption increased from 78.6% in 1946 to 96.1% in 1949.

It is clear from the above that in relation to declining supply in the post-war period, the consumption of hessian in the United States has so far maintained itself fairly well. The falling trend in absolute consumption may perhaps be reversed if the supply of jute goods to the United States can be increased in the near future.

JUTE SUBSTITUTES

Collection of quantitative data on jute substitutes has made some progress. As far as the market in the U.S.A. is concerned, the valuable report of the Low Delegation, which has recently been published by the Indian Jute Mills Association, will provide a mine of information for our study. But reports on the recent growth and development of substitutes in other countries are rather meagre. However, the following broad conclusions can be drawn from the data and information we have been able to collect so far:—

(*1*) Paper bags in the U.S.A. are the most serious rival of jute bags.

(*2*) War-time scarcity was the chief factor responsible for the spectacular rise in the use of paper bags.

(*3*) Post-war scarcity of jute goods, which continues even at the present time, prepared a very good soil for the considerable expansion of the use of paper bags and their cheaper price has been an additional factor in their favour.

(*4*) Although labour cost in the United States is the highest in the world, the production of cheap paper bags has been possible due to the mechanisation and high productivity that obtain in the U.S.A.

(*5*) Attempts have been and are being made in various parts of the world to develop natural fibres as substitutes for jute. But in a number of countries, specially in Europe, these are more or less in the

nature of stop-gap arrangements meant to tide over the difficulties due to the scarcity of jute and jute goods.

(*6*) Recent reports from the U.K. seem to indicate that supply rather than price has led to the switch-over from jute to paper.

The lesson to be drawn from the current position of jute *vis-a-vis* its substitutes is that the most immediate problem is one of adequate supply of jute, the problem of price coming next in importance. Both the war and the post-war periods clearly indicate that without a plentiful supply of jute, substitutes are bound to grow for one reason or other. The objective of the Government of India to achieve self-sufficiency in jute within the shortest possible time is meant to solve the problem of supply.

The problem of price, however, is more difficult to solve. But without a satisfactory solution of this problem, jute in the long run is likely to yield further grounds to substitutes. In the matter of price, however, the interest of the jute grower is involved as much as that of the consumer of jute and jute goods. Our field investigations in some jute growing centres have shown that the only rational and satisfactory way of reducing jute prices would be—

(*1*) To raise the productivity of the soil by various methods of scientific agriculture, and

(*2*) To raise the productivity of the jute grower by the use of mechanical devices as far as possible.

The above methods, if widely adopted, will safeguard the economic condition of the jute grower and at the same time bring down prices as a direct result of increased productivity. They will also help to increase supply by enabling an individual grower to produce more jute from a given piece of land.

STATISTICAL ANALYSIS OF THE DATA ON PHYSIOLOGY OF JUTE

In pursuance of the decision of the Committee, further work on Prof. Sen Gupta's data on physiology of jute was taken up from the middle of October, 1949.

This work involved supplementary statistical analysis of all the data for three years from 1945-46 to 1947-48 and complete analysis of the experimental data for the year 1948-49. In all 160 tables have been prepared summarising the results of the statistical analysis.

REVISION OF THE MARKETING REPORTS

The revision of the Second Marketing Report recorded satisfactory progress during the year under review. Considerable material was collected on the basis of which the several sections were brought up-to-date. The statistical tables and other statements were also checked up. Scrutiny of the first revised draft was completed and considerable progress was made in preparation of the second draft. It is expected that the draft will be submitted to the Publication Sub-Committee soon.

Due to heavy pre-occupation of the Assistant Marketing Officer in connection with the above work and *ad hoc* survey of marketing and transport of jute, it was not possible to undertake revision of the First Marketing Report during the period under report. The detailed survey of important jute markets in connection with this revision will be taken up in the coming marketing season.

SURVEY OF JUTE TRANSPORT POSITION

As transport facilities obtained for moving jute from up-country markets to the terminal market in Calcutta were inadequate, a close watch was kept on the jute transport position. Arrangement was made for collection of information on the facilities available at Belakoba, Monoharpur (West Bengal), Nowgong (Assam), Purnea (Bihar) and Cuttack (Orissa) at regular intervals through the Economic Investigators posted at these centres. Information regarding transport bottlenecks received from them was examined and analysed and when necessary further investigated upon before it was passed on to the Committee's Local Sub-Committee, the Raw Jute Movement Committee or the Government of India for appropriate action. These investigations would thus appear to have enabled us to keep the Government informed about the transport facilities

obtaining from time to time. Some information about the accumulation of stocks due to transport difficulties was also received from the Field Staff of the Committee's Jute Agricultural Research Institute.

The results of the investigations carried out during the year under report are summarised below:—

West Bengal.—Although the transport position was easy at Belakoba (Jalpaiguri) during August 1949, it worsened during September. During October and November, 1949 the situation further deteriorated following the devaluation of the Indian currency. December witnessed some improvement; but available facilities being short of the requirement, considerable stocks were reported to have accumulated. Further investigations showed that all railheads from Siliguri down to Hili (then under the administrative control of the E. B. Raliway) suffered considerably for want of non-supply of wagons. The position further deteriorated in January, 1950. The Assam Railway took over the Haldibari-Siliguri section on the 20th January, 1950 and converted the same from broad guage to meter gauge during the period between the 23rd and 29th January. Goods traffic was completely suspended from the 23rd January and the position remained unchanged till mid-April. Some jute was transported during the same period by trucks to Siliguri and Karagolaghat even at high costs. From the 16th of April onwards wagons were allotted for movement of jute thus easing the position.

Assam.—From the beginning of the season up to October, 1949, the transport position was more or less easy. November was a difficult month; but December saw some improvement although the available freight space was short of the requirement. Large stocks accumulated in the market due to the fact that the river route was practically closed since Assam jute in transit by river route was held up at the border by East Pakistan. In January 1950 although some jute moved by rail (*via* Assam Link) and river route, the quantity was said to be less than half of what had moved in the previous month. High freight charges *via* Assam Link and irregularity of wagon allotment

prevented the up-country dealers from taking full advantage of the facilities offered. Ferrying arrangements between Manihari-ghat and Sakrigalighat were also far from satisfactory. The position in February 1950 was, however, considerably better than in the previous month. From March onward the position showed marked improvement as the river route was thrown open.

Bihar.—The transport facilities in the beginning of the season were so inadequate that the two mills at Katihar were threatened with closure for want of raw jute supply. The position remained unchanged in August but was found to be easier during September and October, 1949. Difficulty was again experienced during the first part of November due to temporary stoppage of booking to Calcutta. Later, the situation was found to improve due to removal of the restriction. Compared to November, December saw a better position, but the available facilities were still inadequate. Besides, Maniharighat proved to be a bottleneck due to insufficient transhipment arrangement. However, slight improvement of the position was seen in January 1950 followed by further improvement in the following month. From March onwards the transport position improved considerably.

Orissa.—As for the position at Cuttack, it was fair from October till December, 1949. Later, the position improved and remained satisfactory throughout the period under review.

It may be mentioned in this connection that the difficulties that were experienced during 1949-50 season were actually foreseen in our reports submitted in the latter part of 1948. These reports revealed, among others, the following principal difficulties particularly with regard to movement of jute into Calcutta from Bihar, Assam and northern districts of West Bengal:

(*1*) Inadequate facilities for transhipment of jute from Maniharighat to Sakrigalighat;

(*2*) Absence of direct rail link between Assam and West Bengal through Indian territories;

(3) The northern districts of West Bengal were practically isolated from the rest of West Bengal. Therefore, all railway consignments had to pass through the E. B. Railway (Pakistan) which was the shortest and cheapest route; and

(4) That the railway stations from Siliguri down to Haldibari then being under the administrative control of the E. B. Railway, allocation of wagons to these stations was not done on a rational basis.

Following were the remedies then proposed—

(1) A railway bridge should be put up at Maniharighat as early as possible in order to remove the transport bottleneck there. Pending such construction, arrangement should be made for ferrying of wagons which will facilitate handling of jute to a considerable extent.

(2) Those railway stations which were situated in the Indian Union but were under the administrative control of the E. B. Railway authorities should be brought under the control of the Assam Railway.

Although no railway bridge was constructed nor wagon-ferries arranged for at Maniharighat-Sakrigalighat, transhipment facilities were increased considerably during the latter part of 1949-50 season. The opening of the Assam Link route from December, 1949 for goods movement removed the long-felt want of a direct rail link between Assam and rest of India. The same route also removed similar difficulties experienced by the northern districts of West Bengal. Administrative control of the Siliguri-Haldibari section was taken over by the Assam Railway from the E. B. Railway authorities in the third week of January, 1950 thus removing an anomalous position.

TRANSPORT POSSIBILITIES FROM JALPAIGURI AND COOCH BEHAR BY ALTERNATIVE ROUTE

Consequent on the devaluation of Indian currency in September, 1949, difficulty of transporting jute and other goods

via E. B. Railway was created by Pakistan resulting in a trade deadlock in Jalpaiguri and Cooch Bihar districts. A comprehensive survey was therefore undertaken with a view to studying the possibilities of finding alternative routes for despatch of jute to Calcutta from the interior areas of these districts.

The survey revealed that although the costs of transport were very high, possibilities existed in transporting jute from Jalpaiguri and Cooch Behar by motor-truck to Naksalbari, Siliguri-North or Maniharighat provided sufficient traffic was available during return journey. Jute from these places were to move further by rail. As for some markets in Cooch Behar, the river route *via* Dhubri was considered more convenient. These along with other suggestions were forwarded to the Government of India for their consideration.

MARKETING AND TRANSPORT SURVEY

The Indian Central Jute Committee at its last half-yearly meeting, while considering the note on the transport position placed before it, expressed the opinion that as the jute development work would continue vigorously in future we should guard against transport difficulties cropping up in 1950-51 season in view of a larger crop to be handled.

Accordingly, a comprehensive survey covering all the jute growing states was undertaken from February and completed in May, 1950. New areas, such as, U.P., Travancore and Madras were also included in the programme and during this period some 68 markets were visited. Apart from the collection of detailed information regarding marketing and transport of jute, particular stress was laid on examination of the possibilities of (*1*) organising purchases through I. J. M. A. agents and (*2*) organising growers' Co-operative jute sale societies. A detailed report of the survey has been prepared which will be placed at the July meeting of the Committee for consideration.

The general conclusions that have emerged from investigations are:—

(*1*) There was some improvement of transport position as compared with that of 1948-49 season, except in North Bihar and in northern districts of West Bengal.

(2) Transport bottlenecks in 1949-50 were mainly due to (*i*) insufficient supply of wagons, (*ii*) lack of co-ordination between seasonal arrivals of jute in secondary markets and seasonal distribution of wagons, (*iii*) insufficient arrangements for ferrying across rivers, (*iv*) certain amount of overlapping of the movement of jute with that of other commodities such as tea during the busiest part of jute marketing season in some areas and (*v*) deadlock in transit facilities through Pakistan territory following on devaluation.

Specific remedies for different areas have been suggested in the report for removing transport bottlenecks as far as possible.

(3) Lack of buyers or lack of storage facilities was not experienced anywhere except in North Bihar nor was there likelihood of any difficulty arising in these respects in view of increased production in 1950.

(4) Prices paid by up-country kutcha balers were on the whole fairly reasonable except in certain markets which suffered from lack of transport facilities from time to time.

(5) It would be in the ultimate interest of the jute mill industry to organise purchases at such centres which appeared to suffer very often on account of transport difficulty due to absence of influential buyers. There were a few such centres in Assam, North Bihar and northern districts of West Bengal. As rest of Bihar and Orissa did not suffer either for want of buyers or transport facilities, no necessity for organising purchases by the I. J. M. A. there appeared to be called for.

(6) Although jute growers realised the benefits of co-operative sales, some amount of scepticism appeared to prevail about the success of Co-operative Jute Sales Societies due to the apathy of the growers. However, it appears that at present the scope of their

operating successfully is limited to areas where a large number of growers directly market their produce themselves, but the prices received are not fair and reasonable. Wide propaganda by the State Governments, particularly among the small growers, should precede the organisation of the societies.

In order that such societies may operate successfully, they should have the financial backing of the government at least in the initial stage. They should also have their own arrangements of baling and despatching. Besides, the transport authorities should give them preference in allotting space.

CO-OPERATIVE JUTE SALE SOCIETY IN NORTH BIHAR

As directed by the President of the Committee, the Director, Economic Research in a letter to the Registrar of Co-operative Societies, Bihar, suggested the necessity for organising co-operative jute sale society in North Bihar. The Registrar in reply forwarded a scheme for organising a Jute Growers' Co-operative Marketing Union in the Purnea Sadar Thana of Purnea District. The scheme was carefully examined in the light of past experiences of the Committee with regard to co-operative societies that were under its control and supervision. The scheme was also considered on the background of the marketing problems of North Bihar as revealed by the recent marketing survey conducted by the Director, Economic Research. A note embodying the Director's comments and suggestions on the scheme has been prepared for the consideration of the Committee at its annual meeting to be held in July next.

'JUTE FUTURES' IN BIHAR

During the year under review, an enquiry on the 'Jute Futures' market said to have been operating in North Bihar was undertaken. The enquiry revealed that owing to the ban on dealings in 'Jute Futures' in West Bengal, some speculators whose normal sphere of activities was confined to Calcutta transferred their activities to Kasba, Forbesganj and Kishanganj—all in the Purnea district—for carrying on such dealings.

They were, however, reported to be directing their operations from Biratnagar, a place in Nepal, and were thus creating undesirable effect on the jute markets.

A note was submitted to the Local Sub-Committee of the Indian Central Jute Committee on this subject and it was suggested therein that in the interest of the jute business, the Government of Bihar should be requested to pass an ordinance similar to one already in force in West Bengal banning 'futures' trading in raw jute.

ENQUIRY REGARDING LOW PRICES OF JUTE IN NORTH BIHAR

During September and October, 1949, loose jute prices in the interior places of North Bihar like Supaul, Saharsa etc. were reported to be very low. A survey was, therefore, undertaken with a view to investigating the causes of such decline in prices. A report was submitted to the Indian Central Jute Committee at its last half-yearly meeting when it was decided that the proposals should be forwarded to the governments concerned for necessary action. Accordingly, the matter was referred to the Governments of India and Bihar.

The enquiry revealed that the price decline was due mainly to lack of transport facilities and absence of organised markets. It appeared that in Supaul, Madhipura and Saharsa, prices of jute varied from Rs. 17/- to 23/- per maund while in the villages near the Gulabbagh market growers were receiving Rs. 29/- and 27/- per maund for Middle and Bottom respectively. Most of the fibre produced in that area was of a very poor quality and were only fit for grading under Bottom and Cross. Besides, operation of jute 'futures' was also responsible to some extent for low prices.

The following remedies were suggested in this connection :—

(1) The Katihar and Murliganj sections of the O. T. Railway should be extended to Saharsa through Madhipura.

(2) The existing railway line from Saharsa to Parasarma should be extended to Nirmali through Supaul.

(3) As the line from Mansi to Saharsa is liable to damage by floods during the rainy season, railway communication is practically suspended in the jute season. An arrangement should therefore be made to make the lines serviceable throughout the year by constructing bridges wherever necessary.

(4) Attempts should be made to set up Co-operative Sale Societies in order to eliminate middlemen and to remove the difficulty of marketing.

(5) The Jute 'Futures' Market should be prohibited by legislation.

The above proposals were forwarded to the Ministry of Agriculture who took up the matter with the Railway Ministry (Railway Board). The Railway Board pointed out that as the area was liable to floods, the question of extending railway lines in that section did not arise until and unless the Kosi Project was put into effect.

This matter was again referred to the Committee for further consideration. After a further survey of the area in question and a careful examination of the transport position, it was pointed out that as there were only two all-weather railway stations, *viz.*, Nirmali and Murliganj, through which jute of Saharsa Sub-district was carried by railway, there was heavy pressure on them. The other two stations, namely, Parsarma and Dauram-Madhepura, remain practically water-logged up to October each year. The latter station is, however, entirely closed for booking up to late November. It was, therefore, desirable that the line through Mansi should be made serviceable throughout the year so that jute carried by this route might be transhipped at Bhagalpur thereby easing the pressure of traffic on Maniharighat. It was further suggested that the wagon supply should be considerably increased at Murliganj, Nirmali and Behariganj if our original proposals could not be put into effect immediately, and that the supply of wagons should be adjusted to the seasonal arrivals. The proposed extension of the Purnea-Murliganj line westwards for 6 to 10 miles was certainly desirable, as besides relieving pressure on Murliganj, it would encourage increase in jute cultivation due to opennig up of new markets. It was also pointed out that trains

went up to Parsarma only, as part of the line between Parsarma and Supaul was lying unused and practically unserviceable. It was, therefore, suggested that this part of the line, a stretch of about 7 miles, should be made serviceable.

The above modified proposals were also forwarded to the Ministry of Agriculture for necessary action.

JUTE POSITION IN NEPAL

A survey was undertaken during the early part of 1949-50 season regarding the position of supply and distribution of jute obtaining in Nepal. Our findings were as follows :—

(*1*) In 1948, the total production was roughly 6 lakh maunds of which two-thirds were produced in Morang district, the rest being produced in Raj Biraj and Jhapa districts.

(*2*) The above quantity was distributed as follows :—

	Mds.
(*a*) Mill consumption	1,50,000
(*b*) Export to Overseas countries ...	1,25,000
(*c*) Export to India (Licensed) ...	2,00,000
(*d*) Estimated quantity smuggled into India	45,000
(*e*) Closing stock on 30.6.49 ...	80,000
Total—	6,00,000

(*3*) No transport difficulty was experienced during 1948-49 season.

(*4*) The acreage in 1949 had increased by 25 per cent; but as there was some damage to the crop due to excessive rainfall, the total output was estimated at 6 lakh mds., same as in the previous season.

(*5*) The distribution of this crop was estimated as below :—

	Mds.
(*a*) Mill consumption	3,00,000
(*b*) Exportable surplus	3,00,000
Total—	6,00,000

(*6*) Mills were likely to retain 80,000 maunds as their reserve stock.

(*7*) No overseas buyer was reported to have visited Nepal for purchase of the 1949 crop.

REPORT ON THE PROSPECTS OF JUTE SOWINGS, AVAILABILITY OF SEEDS ETC.

The Committee's President having directed that information on the prospects of jute sowings in 1950 etc. should also be collected at the time of carrying out the Marketing and Transport Survey, necessary information was collected from all areas at diffierent times between February and May, 1950.

The information was placed before the Local Sub-Committee of the Indian Central Jute Committee.

According to the information collected it appeared that jute sowings in many districts of West Bengal where a considerable proportion of the jute growers consisted of Muslims were likely to be adversely affected due to their migration to East Bengal consequent on disturbances of February, 1950. Besides, the weather was not very favourable during the early part of the season thereby hampering sowings and normal growth of the crop. Cooch Bihar (West Bengal), Goalpara and Kamrup (Assam) districts were seriously affected due to large-scale migration of Muslim cultivators. It was reported at the time of the disturbances that jute sowings in the Lower Assam Valley would be affected. In Upper Assam Valley, however, there was very little disturbance and migration was rather on a small scale, but prospects of jute sowing at the time of the survey were uncertain on account of unsettled conditions. Bihar was not affected to any extent due to migration; but on the other hand, extension of jute cultivation was expected as a result of the self-sufficiency drive. Tripura reported unfavourable weather conditions during early sowing time, but as conditions improved later, sowings were likely to be the same or a little more than that of previous year. Conditions in the Uttar Pradesh were fairly satisfactory and increase in acreage was expected. Orissa being a late sowing area, jute sowings commenced recently and a larger area is likely to be put under jute this year. In the notes submitted in this connection, suggestions were made that cultivator evacuees from East Bengal should be re-settled on the lands abandoned by the

Muslim cultivators in order to make up for the threatened loss of cultivation of jute in India consequent on large-scale migration of Muslim Jute Growers into East Bengal.

As regards seeds, shortage was experienced throughout West Bengal and North Bihar. Assam did not, however, experience much seed shortage. As the Department of Agriculture of Uttar Pradesh procured sufficient seeds for distribution, no seed shortage was felt in Uttar Pradesh either. Although the seed supply was not easy in Tripura there was hardly any shortage.

ENQUIRY ON SUBSTITUTE FIBRES IN INDIA

In pursuance of the Committee's decision in July, 1949, an enquiry regarding substitute fibres that are grown in India was undertaken. Information was mainly collected with the help of the provincial Departments of Agriculture. Some information was also collected through our own *mofussil* staff and incorporated in a note which was placed before the Committee at its last half-yearly meeting. Some valuable information on *Bimli* jute grown in Madras was later collected by the Committee's Assistant Marketing Officer.

From the available information it appeared that of the several substitute fibres grown in India sunn hemp was by far the most important of all, Mesta coming second in importance. Secondly, substitute fibres were generally found to be grown for commercial use in such areas or tracts where jute was either absent or only grown to a limited extent. For example, Madras, Madhya Pradesh, Uttar Pradesh, Bombay and Punjab were the important states where Sunn Hemp and Mesta were generally grown. Besides, Bihar, West Bengal and Orissa also cultivated these crops to some extent. Mesta was also grown in Hyderabad in large quantities.

As for their uses the enquiry revealed that a very large portion of the Sunn Hemp crop was exported; it was used internally for manufacture of twines for making of fishing-nets or camouflage nets (for the army). In Madras, the fibre was said to be used for making of gunny bags, tails of *mhote* buckets and harness for pack bullocks. *Mesta* or *Bimli* jute, as it is called in

Madras, has also a considerable overseas demand, besides being used in jute mills of Madras in admixture with jute for production of sacks. This is also extensively used in rope and cordage making. During 1949-50 season, considerable quantity of *Mesta* was used also by mills of West Bengal in admixture with jute in order to make up for the short supply of jute.

In view of their importance it was suggested that the State Governments should be requested to collect necessary data and information on them regularly and forward the same to the Indian Central Jute Committee for its information.

COLLECTION OF JUTE SAMPLES

It was decided by the Indian Central Jute Committee earlier that as the Technological Research Laboratories would require some representative loose jute samples for technological tests, the Committee's Assistant Marketing Officer should collect them from such places in the Indian Union which he would be visiting in course of survey work. As the Marketing and Transport Survey involved considerable touring on the part of the Committee's officers and staff, it was later decided that samples should be collected during these tours. Necessary instructions were accordingly drawn up for the guidance of the collecting officers and staff. Some samples were collected from different areas and sent directly to the Technological Research Laboratories, but booking restrictions did not permit the collection of a large number of samples.

DISSEMINATION OF CALCUTTA LOOSE JUTE PRICES

The Calcutta loose jute price information was collected daily from two reputed brokers' firms. Prices were however sent out bi-weekly to 46 selected centres of the jute growing states from the beginning of the season. Later, the service was also extended to 76 members of the Development staff of the Jute Agricultural Research Institute from November, 1949. The service was however suspended from the last part of December, 1949 as the quotations remained unchanged at their maximum levels. Prices were also sent to the 5 economic

investigating centres during the same period in order to keep the Investigators as well as the farmers well posted with the trend of the Calcutta market which considerably influenced the mofussil markets.

SALES TAX ON RAW JUTE

An enquiry was undertaken on the tax on sales of raw jute and its incidence. Investigations revealed that the following taxes were imposed on raw jute in the various jute growing states:—

State	Sales Tax	Other Taxes
West Bengal	No sales tax.	Purchase tax at the rate of 2 annas per maund is levied on all jute purchased by jute mills in West Bengal and on all jute purchased and shipped outside West Bengal by a shipper of jute.
Bihar	Six pies per rupee leviable on all dealers.	
Assam	Six pies per rupee leviable on sales completed within the State by dealers with total turnover exceeding Rs. 10,000/- annually.*	
Orissa	Three pies per rupee levied on dealers whose value of transaction is not less than Rs. 5,000/- annually.	

* It is understood that while the balers have to pay the tax at this rate, the mill buyers are exempted from paying the same. The Assam Jute Dealers' Association are reported to have represented to the government for the removal of this anomaly.

When the above taxes were levied by the different State Governments, it was presumed that the taxes would be borne by those from whom they were to be realised. In actual practice, however, the incidence of the taxes was in most cases pushed back and passed on to the cultivators through different middlemen. A recent survey undertaken by us in important secondary markets has revealed that the *mofussil* balers and dealers work

out the *mofussil* parity price which they pay to the growers by deducting their total costs and charges from Calcutta price. In those costs and charges, they include any local taxes, such as sales tax, which may have to be paid by them. The total charge as calculated by the *mofussil* balers also includes the amount of tax which they have to pay in Calcutta. Thus the grower's price is reduced by the amount of the sales tax. In other words the incidence of sales tax is passed on to the growers.

As for Assam, perhaps nothing was charged by the balers on this account in 1948-49 season. The dealers were under the impression that as jute was sold in Calcutta, this did not constitute sale within Assam and therefore they were not liable to pay the Assam Sales Tax. But, the Assam Government has imposed tax on the total exported quantity by each dealer taking it as sold within the state, while on the other hand, mill agents are excluded from paying the tax. This, however, has led to a dispute between the Government and the jute dealers.

MISCELLANEOUS

(*i*) Information regarding cost of baling and shipping of raw jute was supplied to the Director General of Commercial Intelligence.

(*ii*) Detailed information of Export Quotas for raw and manufactured jute, export duties on both, loose jute standards and *pucca* bale marks was supplied to the Department of Corrections, California, U.S.A.

(*iii*) A monthly statement showing comparative prices for *mesta* and jute was furnished to the Economic and Statistical Adviser, Ministry of Agriculture, Government of India with effect from August, 1949.

(*iv*) A lecture with demonstration was given by the Assistant Marketing Officer to the U.P. Jute

Inspectors under training in Calcutta on the grading of loose jute.

(*v*) A note on the jute price structure was prepared and forwarded to the Economic and Statistical Adviser, Ministry of Agriculture, Government of India.

(*vi*) A statement showing the estimated jute stocks lying at important baling centres at the end of August and September, 1949 was furnished to the Government of India.

(*vii*) Loose jute price information for some *mofussil* markets of West Bengal, Assam, Bihar and Orissa together with Calcutta prices for the corresponding qualities of raw jute as well as manufactured goods were supplied to the Economic and Statistical Adviser to the Government of India.

(*viii*) From November, 1949, balers' prices prevailing at the 5 investigating centres were sent to the Economic and Statistical Adviser, Ministry of Agriculture.

(*ix*) Mofussil baler's price quotation for 'Assam' and 'Western' jute were furnished from November, 1949 on weekly basis to the Statistical Research Officer in the office of the Economic Adviser to the Government of India; corresponding Calcutta prices were also supplied.

(*x*) Information regarding the position of the Calcutta Raw Jute market together with a rough indication about the future possibilities during the current season was furnished to the Senior Marketing officer, Orissa. An analysis regarding the incidence of the Sales Tax on jute in Orissa was also sent to him.

(*xi*) Monthly progress note on Marketing work was submitted to the Agricultural Marketing Adviser to the Government of India for publication in the Agricultural Marketing Notes.

(*xii*) Several trade and official enquiries were attended to.

Routine work which consisted of collection of *mofussil* raw jute and *mesta* prices, collection of Calcutta prices for raw as well as manufactured jute, preparation of weekly and monthly market reviews etc., was also attended to in addition to the above work.

ACKNOWLEDGMENT

The Director, Economic Research, desires to express his grateful thanks to the India Government Trade Commissioners in foreign countries and to the Indian Jute Mills Association and other Jute Trade Associations for their valued co-operation in supplying useful information on Jute Trade and Industry. We are also grateful to Messrs. J. C. Duffus & Co., J. Thomas & Co., (Jute and Gunnies) Ltd., H. D. Cartright & Co., Landale & Clerk Ltd., R. Sim & Co., Sinclair Murray & Co., Ltd. and B. Adhikary & Co. for supplying market information as before. Thanks are also due to different State Governments and other organisations from whom valuable co-operation has been received in connection with the marketing and transport survey. The Director, Economic Research, also takes this opportunity to record his appreciation of the loyal support and unstinted help which he received from the staff of the Economic Research Section.

K. C. BASAK,

21st June, 1950. *Director of Economic Research.*

APPENDIX

Programme of work for 1949-50	Progress made	Future work
1. Investigation into the economics of jute growing	This was the second year of the investigation which was carried out in five centres, of which four were the same as in 1948 while the fifth centre in Assam was shifted from Rupohi to Nowgong for better facilities of work. Report of the investigation for 1949-50 has been prepared which includes a special study of cost of production of jute in share-rented plots. The investigation for 1950-51 is making good progress. A number of pure share-croppers have been included among selected farmers at each centre with the object of making a detailed study of share-croppers.	The investigation will continue and attempts will be made to improve its technique still further.
2. Improved methods of cultivation	The improved methods of cultivation evolved by the Jute Agricultural Research Institute are being tried out on a small scale under cultivator's condition at the five centres of investigation. Superiority of these methods over traditional methods will	The work will continue during 1950-51 season.

Programme of work for 1949-50	Progress made	Future work
	be demonstrated to the jute growers and also a comparative study of the cost of production under the two methods will be made. Technical difficulties experienced in course of the work are also being investigated.	
3. Study of mofussil prices of jute and other statistics	Data regarding arrivals, grade outturn, price etc. for jute and price data for paddy and rice were collected from the five centres of investigation. The relative movement of prices of jute and rice was analysed and the results were regularly reported to the monthly meetings of the Local Sub-Committee. A special investigation was undertaken to estimate the parity prices of jute at the five centres of investigation. A detailed report on the scheme has been prepared.	This scheme has been made a permanent feature in the programme of work.
4. Study of American Market for jute goods	The effect of devaluation of the rupee on prices of jute goods in the U.S.A. has been investigated and the causes of rising prices in the U.S.A. in the post-devaluation period have been analysed.	Further investigations into the American market will be made.

	The trend of hessian consumption in U.S.A. in relation to supplies from India has also been investigated.	
5. Jute Substitutes	Collection of quantitative data on jute substitutes has made some progress. Available data have been analysed and some conclusions have been drawn regarding the problems of supply and price of jute.	This subject will be under continuous study.
6. Statistical analysis of data on physiology of jute	Prof. Sen Gupta's data on physiology of jute for four years from 1945-46 to 1948-49 were taken up for further statistical analysis. In all 160 tables have been prepared summarising the results of the analysis.	This work will be completed by the end of June 1950.
7. Revision of Marketing Reports	First draft of the revision of the Second Marketing Report was scrutinized and fresh material collected for incorporation in the draft. Considerable progress was made in preparation of the second draft.	The draft of the revision of the Second Marketing Report will soon be submitted to the Publication Sub-Committee and in the light of their comments and suggestions the final draft will be made ready for publication. The detailed survey of important jute markets in connection with the revision of the First Marketing Report will be taken up in the coming marketing season.

Programme of work for 1949-50	Progress made	Future work
8. Survey of jute transport position	Regular periodic investigations of the jute transport position were undertaken by the field staff of the Section. Information regarding transport bottlenecks during 1949-50 season was passed on to proper quarter for necessary action.	This work will be continued in future.
9. Transport possibilities from Jalpaiguri & Cooch Behar	A survey was undertaken to explore the possibilities of despatching jute from Jalpaiguri and Cooch Behar by alternative routes which became necessary as a result of transport deadlock following on devaluation. Suitable recommendations were made in the report of the survey in order to meet the emergency.	Such *ad hoc* surveys will be undertaken whenever necessity arises.
10. Marketing and transport survey	A comprehensive survey of the marketing and transport position in all the jute growing states was undertaken in the early part of 1950. New areas, such as U.P., Madras and Travancore were also included in the programme and in all some 68 markets were visited. The main object of the survey was to investigate the marketing and transport	Such surveys should be undertaken every season in view of the drive for self-sufficiency in jute.

	difficulties experienced in 1949-50 season and to suggest remedies in order to afford better marketing and transport facilities in the coming season when a much larger crop of jute is expected to be produced. In course of the survey a large volume of statistical and other information on structure of mofussil markets, marketing practices and methods of transport was also collected.	
11. Co-operative jute sale society in North Bihar	The Registrar of Co-operative Societies, Bihar, forwarded a scheme to the Committee for organising a Jute Growers' Marketing Union in Purnea. The scheme has been examined and some comments and suggestions have been made for its successful working.	If the scheme is approved by the Government of Bihar, necessary help will be rendered by the Marketing staff of the Committee for organising the Union.
12. 'Jute Futures' in Bihar	An enquiry on the 'Jute Futures' market reported to have been operating in North Bihar was undertaken. A note incorporating suggestions for stopping speculation in jute in Bihar was submitted for the consideration of the Local Sub-Committee.	
13. Low prices of jute in North Bihar	A survey was undertaken to study the causes of low prices of jute in certain parts of North Bihar. The report of the survey	

Programme of work for 1949-50	Progress made	Future work
	containing specific recommendations was considered by the Committee at its meeting in January 1950 and it was forwarded to the Governments of India and Bihar for necessary action.	
14. Jute position in Nepal	A survey was carried out in the early part of 1949-50 season regarding the position of supply and distribution of jute obtaining in Nepal.	
15. Prospects of jute sowings in 1950	In course of the marketing and transport survey, information on prospects of jute sowings in 1950, availability of seeds, etc., was collected from all areas between February and May 1950. In particular, the effect of disturbances in the early part of 1950 on jute sowings was investigated.	
16. Substitutes fibres in India	Information on substitute fibres grown in India was collected mainly from Departments of Agriculture of the State Governments. A report on the subject was considered by the Committee at its meeting held in January, 1950.	State Governments have been requested to furnish the Committee with regular information which will be analysed as and when received.

17. Collection of jute samples	In course of the Marketing and transport survey some samples of jute grown in different jute areas were collected for the Committee's Technological Research Laboratories. But booking restrictions did not permit the collection of a large number of samples.	Samples will be collected in course of future surveys.
18. Dissemination of Calcutta Loose Jute Prices	This regular service of price information meant for the growers was further extended to the 76 members of the Development staff of Jute Agricultural Research Institute.	This will continue as before.
19. Sales tax on raw jute	An enquiry was undertaken on the tax on sales of raw jute and its incidence in different jute growing states.	
20. Miscellaneous	A large volume of miscellaneous work of a varied nature was undertaken. Several notes were prepared and furnished to different quarters and many trade and government enquiries on a number of topics, were attended to.	This type of work is increasing in volume and is likely to absorb much time in future.

APPENDIX IV

ANNUAL REPORT OF THE PUBLICITY SECTION FOR 1949-50.

In the year gone by, work in the Publicity Section has been satisfactory.

There were some initial handicaps. The late Mr. Quaderi, Publicity Officer, went on leave on March 19, 1949 and Mr. Mukherji, Publicity Assistant, was put in charge of the section.

Things were in arrears but Mr. Mukherji brought them up-to-date.

The issue of the monthly Jute Bulletin has been regularly brought out within the first fortnight of every month. This regularity in the publication of the Bulletin has been noticed by the members of the Committee.

Mr. K. D. Jalan expressed his appreciation of the Bulletin at the 89th meeting of the Local Sub-Committee held on May 30, 1949, in the following words: "Thanks were due to the Secretary for bringing out the Jute Bulletin in time. It was more up-to-date and elaborate and contained more information than before".

At the 97th meeting of the Local Sub-Committee held on March 1, 1950, it was observed that the "publication of the Bulletin had become very regular and satisfactory".

Press Publicity

In giving a resume of this Section's activities, the progress in Press publicity is being mentioned first.

At one time before the partition Calcutta had a large number of dailies and weeklies which did the publicity of the Committee's activities.

But as many of these closed down, publicity is now mainly confined to The Statesman, The Amrita Bazar Patrika and The Hindusthan Standard.

Even then, as the statement attached will show, publicity has increased this year (1949-50) to 1050 column inches as compared to 753 in 1948-49.

It is also evident that there has been a greater appreciation in the Press now than before of the Committee's activities.

While much of this jute consciousness is due to various factors, it is also partly due to systematic Press contacts made by the Publicity Section.

Fifty Press and Un-official Notes were issued by the Publicity Section during the period under review.

Some of the subjects dealt with in these notes were:

(1) Australian Flax Industry at Crossroad;
(2) French Jute Industry in Crisis;
(3) Indian Central Jute Committee Recommends Use of Mesta;
(4) Brazil's Plans for Self-sufficiency in Jute;
(5) C. R. Nodder's Talk on Jute Substitutes;
(6) South African Jute Substitutes;
(7) Jute Production in U. P.;
(8) Drastic Decline of Burlap Consumption in the U.S.A.;
(9) World Hard Fibre Output;
(10) German Jute Industry;
(11) Rhodesia Produces Grain Bag;
(12) Thailand to Have Jute Bag Factory;
(13) Interesting Results in Jute Technology;
(14) Trial Jute Planting in Philippines;
(15) Jute Production Target for 1950—Decisions at Indian Central Jute Committee Meeting; and
(16) Caroa May Become Brazil's National Fibre.

It may be added that some of these notes occasioned editorial discussions.

GROW MORE JUTE PROPAGANDA

This section also supplied the necessary theoretical background to the Committee's 'grow more jute' propaganda.

The Director, Jute Agricultural Research Institute, was assisted in preparing illustrated leaflets on improved and scientific methods of jute cultivation. Press summaries of these leaflets received wide publicity.

Every opportunity was profitably utilized to keep the reading public conversant with the Committee's 'grow more jute' activities and as many as 20 Press-Notes were issued in this connection.

These covered all the tours undertaken from Calcutta by the President, Indian Central Jute Committee, and the Director, Jute Agricultural Research Institute, of the jute growing areas.

JUTE BULLETIN

The publication of Jute Bulletin had been in arrears during the early part of the past official year (1949-50).

The late Publicity Officer went on leave causing a temporary dislocation in the section's work.

The Publicity Assistant single-handed took up the job willingly and brought out the March and April issues of Jute Bulletin as also three back numbers of the Bulletin's index—all in the month of May 1949.

Attention has also been paid to the improvement of Jute Bulletin. The Bulletin has grown in quality and volume. During the past 5 years 1945-49, both inclusive, the Bulletin's contents averaged 30 pages. The Jute Bulletin of the year under review (1949-50) averaged 52 pages.

As regards quality, Jute Bulletin has ceased to be a mere bulletin and it may now appropriately be named as Journal of Jute. Its contents are now properly scrutinised and conveniently classified with suitable headlines. Improvement in general of the Bulletin has been the watchword of the Publicity Section. Two new periodical features have been intro-

duced. One of them is devoted to the jute industry's views, while discussions at the Technological Research Laboratories Science Colloquium make up the contents of the other. Books are occasionally reviewed in Jute Bulletin and photographs published.

The Bulletin's circulation has increased as also its casual sales.

Articles were received from Moscow and Paris for publication in the Bulletin.

A few foreign subscribers changed over from sea-mail to air-mail to get their copies of the Bulletin in time.

Jute Bulletin is serving another useful purpose, namely that the results of researches in the Committee's technical sections are regularly published in it.

The Bulletin has also had its publicity through Press summaries which were reproduced by several newspapers and journals.

It may have been noticed by the readers of 'Capital' that its Jute Section is at times 40% Jute Bulletin.

Advertisements in Jute Bulletin

The value (gross) of space sold to advertisers during 1949-50 amounted to Rs. 1,600/-.

The Publicity Section started an advertisement securing campaign with a view to making the Bulletin as much self-sufficient as possible. In this connection more than 100 copies of a circular letter explaining how "you profit by advertising in Jute Bulletin" were issued to leading firms and trading concerns, and as a result, a few advertisements were secured.

Radio Publicity

Extracts from the Committee's *communiques* issued by the Publicity Section figured prominently on several occasions in the news bulletins (local announcements) broadcast by the Calcutta Centre, All-India Radio.

NEW RELEASES

Four new publications of the Indian Central Jute Committee were released by the Publicity Section during the period under review. They were

(1) Economic Research Memoir No. 2—Dealing with Economic Analysis of the American Market for Jute and Jute Manufactures;

(2) Agricultural Research Memoir No. 5—Dealing with the Genetics of Corchorus;

(3) The Effect of Variation in Grist and Twist on the Strength of the yarn;

(4) A Quick and Simple Method of obtaining the Mean and its Standard Error and the Co-efficient of variation in Textile Tests with Special Reference to the Measurement of Yarn Strength.

Simultaneously with the release of the Economic Research Memoir No. 2, a Press Summary of the same was sent out.

The Press Summary received wide publicity. As a result, more than 80 per cent of the total 500 copies printed sold out in a few months.

SALE AND DISTRIBUTION OF PUBLICATIONS

The total number of Indian Central Jute Committee's publications sold and distributed during the period under review is 8000 approximately. Demand was much greater and could only be partially met as most of the publications had been out of stock. It may be added that L.S.C. has now sanctioned the reprinting of the "out of stock" publications during the current year after proper revision of the contents.

PRICE DISSEMINATION SERVICE

The Committee's Price Dissemination Service operated by the Publicity Section was continued upto the middle of January. 2335 Price Cards containing daily quotations of the Calcutta Loose Jute Market were distributed to various centres

in West Bengal, Bihar, Orissa, U.P., Travancore, Cooch-Behar and Tripura. Following the fixation of prices by the Government, the Publicity Section stopped sending Price Cards at the instruction of the Director, Economic Research.

JUTE MUSEUM

Jute carpets of different shades and designs were secured from Mr. M. P. Birla and Mr. K. D. Jalan's groups of mills during the year under review, to be kept as exhibits in the Committee's museum.

Duplicates of the existing charts having been prepared, the organisational work of the museum may now be considered complete.

The floor space being limited cannot permit much further expansion of the museum.

The Jute Museum participated in the Exhibition on Basic Education held in the Commercial Museum, Calcutta.

The Committee's stall was very popular to visitors.

Exhibits from the Committee's Museum were also displayed in the Jute Section of the Exhibition in connection with the Campaign for Adult Education, held in Delhi.

The Museum is often attracting appreciative visitors like distinguished Government officials and representatives of various foreign consulates.

ACKNOWLEDGEMENTS

The Publicity Section takes this opportunity of expressing their thanks to the Indian Jute Mills Association, to the Press and news agencies—inland and overseas, and also to the All-India Radio for their help and co-operation in their respective spheres.

Analysis of Publicity obtained for the Press and Un-official Notes issued by the Publicity Section during 1949-50.

Names of Periodicals and Newspapers.	Column ins. 1949-50	Column ins. 1948-49
1. The Statesman	91	37
2. The Hindusthan Standard	100	103
3. The Ananda Bazar Patrika	139	50
4. The Amrita Bazar Patrika	99	40
5. The Jugantar	87	36
6. Commerce & Industry	61	42
7. Commerce	89	130
8. Capital	160	90
9. Indian Finance	35	x
10. Indian Textiles Journal	28	x
11. Cordage Magazine	71	80
12. Jute & Canvas Review	41	105
13. Cordage World & Iudustrial Textiles	8	40
14. Daily Mill Stock Reporter	41	x
Total	1050	753

The above is only a partial publicity analysis covering 14 journals to which we have access. The Publicity Material is actually issued to 90 journals recommended by the Central Government. For lack of proper staff and access to all of the 90 journals, it is not possible to maintain a detailed and complete analysis. Reference by parties now and then bear evidence to the fact that our Press-Notes are published in other important journals, besides those listed above.

A Tabular Statement Indicating the Sanctioned Programme of work of the Publicity Section and Progress Made under each Item.

Programme Sanctioned	Progress Made	Remarks.
(1) Production and Distribution of the Monthly Jute Bulletin;	Except for its first two issues, Jute Bulletin was produced and distributed regularly every month.	Jute Bulletin has risen to the stature of a fullfledged journal. It has grown both in volume and importance.
*(2) Press campaign by means of Press Notes and articles illustrated with pictures in the Press.	50 Press and Un-official notes were issued.	*Press publicity obtained during 1949-50 was remarkable.
(3) Arrangement for broadcasting Radio talks.	Extracts from important Press Notes were broadcast through the courtesy of the All India Radio authorities.	
(4) Preparation and distribution of posters, as necessities arise;		No occasion arose during the period.
(5) Preparation and distribution of propaganda leaflets and pamphlets;	The Publicity Assistant assisted Director, J. A. R. I. in preparing propaganda leaflets and arranging their Press Publicity.	Press consumption of summaries of these leaflets was satisfactory.
(6) Loose Jute Price Dissemination Service;	2335 price cards containing Calcutta Loose Jute Market quotations were sent out by the Publicity Section to centres recommended by the Committee.	The Price Dissemination Service was suspended following the Govt. fixation of loose jute prices.
(7) Organisation of Central Jute Museum;	Jute carpets of every shade and design were secured from Mr. M.P. Birla. Exhibits of the I. C. J. C. Museum were displayed in exhibitions held in Calcutta and Delhi.	The floor-space now available is insufficient for further development of the museum.
(8) Sale and Distribution of all I.C.J.C. publications.	The total number of I. C. J. C. publications sold and distributed during the period is 8,000 approximately.	Demand could not be fully met as several important publications were out of stock.

LIST OF INDIAN CENTRAL JUTE COMMITTEE PUBLICATIONS.

You will always find something to interest you in the following :—

"JUTE BULLETIN"
(A Popular Monthly Journal on Jute and Allied Fibres circulating in almost all countries)
Subscription—Rs. 5-8-0 (Inland), 10s (Foreign) (Including postage)

REPORT ON MARKETING AND TRANSPORT OF JUTE IN INDIA
FIRST REPORT
Price—Rs. 1-8-0 or 2s. 6d. (Out of Stock)

REPORT ON MARKETING OF JUTE AND JUTE PRODUCTS
SECOND REPORT
Price—Rs. 2-8-0 or 4s. (Out of Stock)

A REVIEW OF THE WORK OF THE INDIAN CENTRAL JUTE COMMITTEE
December, 1936 to March, 1940.
Price—Re. 1-0-0 or 2s.

WORLD CONSUMPTION OF JUTE
ECONOMIC RESEARCH MEMOIR NO. 1.
Price—Re. 0-12-0 or 1s.

ECONOMIC ANALYSIS OF THE AMERICAN MARKET FOR JUTE AND JUTE MANUFACTURES
ECONOMIC RESEARCH MEMOIR NO. 2.
Price—Rs. 1/4/- or 2s.

WORLD CONSUMPTION OF JUTE 1938-39 & 1939-40
ECONOMIC RESEARCH BULLETIN NO. 1.
Proce—Re. 1-0-0 or 1s. 6d. (Out of Stock)

JUTE SUBSTITUTES
ECONOMIC RESEARCH BULLETIN NO. 2.
Price--Re. 0-11-0 or 1s. (Out of Stock)

JUTE : SOME ASPECTS OF DEMAND AND SUPPLY
ECONOMIC RESEARCH BULLETIN NO. 3.
Price—Re. 0-8-0 or 9d. (Out of Stock)

THE RELATION BETWEEN THE PHYSICAL FIBRE CHARACTERS AND THE SPINNING QUALITY OF JUTE—1
TECHNOLOGICAL RESEARCH MEMOIR NO. 2.
Price—Re. 1-0-0 or 2s. (Out of Stock)

THE MOISTURE REGAIN OF JUTE AT A RANGE OF ATMOSPHERIC HUMIDITIES
TECHNOLOGICAL RESEARCH MEMOIR NO. 3.
Price—Re. 1-0-0 or 2s. (Out of Stock)

TESTS ON COMMERCIAL JUTE YARNS
TECHNOLOGICAL RESEARCH MEMOIR NO. 4.
Price—Rs. 1-4-0 or 2s. 3d. (Out of Stock)

THE BALLISTIC WORK OF RUPTURE OF TWISTED BUNDLES OF JUTE FIBRE AND ITS RELATION TO SPINNING QUALITY
TECHNOLOGICAL RESEARCH MEMOIR NO. 5.
Price—Re. 0-8-0 or 9d. (Out of Stock)

THE RELATION BETWEEN THE CHEMICAL FIBRE CHARACTERS AND THE QUALITY OF JUTE
TECHNOLOGICAL RESEARCH MEMOIR NO. 6
Price—Re. 0-12-0 or 1s. (Out of Stock)

MEASUREMENT OF IMPORTANT PHYSICAL CHARACTERS OF JUTE FIBRE STRANDS AND THEIR RELATION TO YARN QUALITY

TECHNOLOGICAL RESEARCH MEMOIR NO. 7.

Price—Re. 0-14-0 or 1s. 3d. (Out of Stock)

THE APPARENT DENSITY OF JUTE FIBRE AND ITS RELATION TO SPINNING QUALITY

TECHNOLOGICAL RESEARCH MEMOIR NO. 8.

Price—Re. 0-12-0 or 1s. (Out of Stock)

THE SINGLE THREAD STRENGTH OF JUTE YARNS IN RELATION TO TEST LENGTH

TECHNOLOGICAL RESEARCH MEMOIR NO. 9.

Price—Re. 1-0-0 or 1s. 6d. (Out of Stock)

THE EFFECT OF MOISTURE ON THE STRENGTH OF JUTE YARNS

TECHNOLOGICAL RESEARCH MEMOIR NO. 10.

Price—Re. 0-6-0 or 6d. (Out of Stock)

सत्यमेव जयते

IMPROVEMENT OF JUTE BAGS FOR THE STORAGE OF SUGAR

TECHNOLOGICAL RESEARCH MEMOIR NO. 11.

Price—Re. 0-12-0 or 1s.

THE PREPARATION AND SPINNING OF FLAX ON JUTE MACHINERY

TECHNOLOGICAL RESEARCH PAMPHLET NO. 1.

Price—Re. 0-4-0 or 6d. (Out of Stock)

ASSESSMENT OF SPINNING QUALITY

TECHNOLOGICAL RESEARCH PAMPHLET NO. 2.

Price—Re. 0-6-0 or 6d. (Out of Stock)

SOME NOTES ON THE STRENGTH OF JUTE PLY YARNS

TECHNOLOGICAL RESEARCH PAMPHLET NO. 3.

Price--Re. 0-6-0 or 6d. (Out of Stock)

TECHNOLOGICAL RESEARCH RESULTS 1938-44

Price—Re. 0-14-0 or 1s. 3d.

ANATOMICAL STUDIES ON JUTE-CORCHORUS WITH SPECIAL REFERENCE TO THE FORMATION OF FIBRE

AGRICULTURAL RESEARCH MEMOIR NO. 1.

Price—Rs. 1-8-0 or 2s. (Out of Stock)

ANATOMY OF RETTED JUTE

AGRICULTURAL RESEARAH MEMOIR MO. 2.

Price—Re. 1-0-0 or 1s. 6d. (Out of Stock)

THE GENETICS OF CORCHORUS JUTE

AGRICULTURAL RESEARCH MEMOIR NO. 3.

Price--Rs. 3-0-0 or 4s. 6d. (Out of Stock)

सत्यमेव जयते

TECHNIQUE OF FIELD EXPERIMENTS IN JUTE

AGRICULTURAL RESEARCH MEMOIR NO. 4.

Price—Re. 0-14-0 or 1s. 1d.

A REVIEW OF AGRICULTURAL INVESTIGATIONS ON JUTE IN INDIA

AGRICULTURAL RESEARCH BULLETIN NO. 1.

Price—Rs. 1-8-0 or 2s. 3d. (Out of Stock)

JUTE BREEDING EXPERIMENTAL TECHNIQUE

AGRICULTURAL RESEARCH BULLETIN NO. 2.

Price—Re. 0-8-0 or 9d. (Out of Stack)

JUTE

Price Rs. 1-8-0 or 2s. (Out of Stock)

THE STRENGTH GRIST AND QUALITY RATIO OF JUTE YARNS

TECHNOLOGICAL CIRCULAR NO. 1.

Price—Rs. 1-5-0 or 2s.

THE RELATIONSHIP BETWEEN TWIST FACTOR AND STRENGTH IN JUTE YARNS

TECHNOLOGICAL CIRCULAR NO. 2.

Price—Re. 0-10-0 or 1s.

THE GENETICS OF—CORCHORUS JUTE

AGRICULTURAL RESEARCH MEMOIR NO. 5.

Price—Rs. 1-8-0 or 2s.

N.B.—Except the "Jute Bulletin" the prices quoted above *exclude Postage*.



APPENDIX V

List of Members of the Indian Central Jute Committee showing their names and addresses.

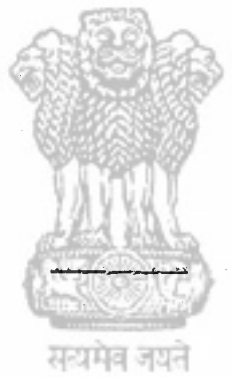
(1) The Vice-Chairman, Indian Council of Agricultural Research.	Sardar Datar Singh, F.R.S.A., M.D.D., Addl. Secretary to the Govt. of India, Ministry of Agriculture, New Delhi.
(2)	The Agricultural Commissioner with the Government of India, Ministry of Food and Agriculture, New Delhi.
(3) Four persons nominated by the Government of India.	1. Shri B. K. Das, Contai, Midnapore. 2. Mr. Lakshmipat Singhania, Kamla Tower, Kanpur. 3. Dr. K. Venkataraman, Director, Department of Chemical Technology, University of Bombay, Matunga, Bombay. 4. Mr. L. K. Jha, Chief Controller of Exports, Ministry of Commerce, New Delhi.
(4) A representative of the Agricultural Department of the Govt. of West Bengal nominated by that Government.	The Director of Agriculture, Animal Husbandry & Fisheries, West Bengal, Writers' Buildings, Calcutta.
(5) A representative of the Agricultural Department of the Govt. of Bihar nominated by that Government.	The Director of Agriculture, Bihar, Patna.

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(6) A representative of the Co-operative movement in West Bengal nominated by the Government of West Bengal.	The Registrar of Co-operative Societies, West Bengal, 8, Lyons Range, Calcutta.
(7) Two members elected by the Indian Jute Mills Association.	1. Mr. I. G. Kennedy, C.B.E., C/o. Messrs. Jardine Henderson Ltd., 4, Clive Row, Calcutta. 2. Mr. F. H. Kidd, C/o. Messrs. Thomas Duff & Co., 2, & 3, Clive Row, Calcutta.
(8) One member elected by the Bengal Chamber of Commerce.	Mr. T. B. Elley, Messrs. Sinclair Murray & Co., 8, Royal Exchange Place, Calcutta.
(9) One member elected by the Bengal National Chamber of Commerce.	Mr. J. N. Sen Gupta—Hindusthan Development Corporation Ltd., 4, Chittaranjan Avenue, Calcutta.
(10) Two members elected by the Indian Chamber of Commerce.	1. Mr. K. D. Jalan, C/o Messrs. Surajmull Nagarmull, 8, Dalhousie Square, Calcutta. 2. Mr. Bhagirath Kanoria, C/o Messrs. The General Produce Co. Ltd., 8, Royal Exchange Place, Calcutta.
(11) One representative of the Shipping & Baled Jute interests nominated by the Calcutta Baled Jute Association.	Mr. G. Euthymopulo, C/o Messrs. Rally Brothers, 16, Hare Street, Calcutta.

(12) One representative of the Jute trade nominated by the Government of Bihar	Mr. Mohanlal Jeloka, Katihar District, Purnea.
(13) One representative nominated by the Government of Assam.	Mr. G. C. Bora, B.Sc., B.L., Nowgong, Assam.
(14) Three representatives of agricultural interests of West Bengal nominated by the Government of West Bengal.	1. Sree Haripada Chatterjee, M.L.A., Sahebnagar, Nadia. 2. Sree Kishori Mohan Das, President, Basirhat Sub-Divisional Congress Committee, Basirhat, 24-Parganas. 3. Sree Sudhangshu Sekhar Singha Roy, M.A., B.L., Kaikala, Dist. Hooghly.
(15) Two jute-growers nominated by the Government of Assam.	1. The Director of Agriculture, Assam, Shillong. 2. Mr. Purandar Sharma, M.L.A., Mangaldai, Dt. Darrang, Assam.
(16) Two jute-growers nominated by the Government of Bihar.	1. Rai Bahadur Raghubans Prosad Singh, Kursela, P.O. Ayodhyaganj Bazar, Sadar Sub-Division, District Purnea. 2. Mr. Baidyanath Chowdhury, President, District Congress Committee, Purnea.

(17) One member nominated by the Govt. of Orissa to represent interests of Orissa.	The Director of Agriculture, Orissa, Cuttack.
(18) One member nominated by the Government of U. P. to represent the interests of U. P.	Mr. John A. Manawwar, M.A., B.SC. Edin, Jt. Director of Agriculture, Uttar Pradesh.



APPENDIX VI

List of members of the Standing Sub-Committees of the Indian Central Jute Committee

Local Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E., *Chairman.*
3. Mr. F. H. Kidd.
4. Mr. T. B. Elley.
5. Mr. K. D. Jalan.
6. Mr. Sudhangshu Sekhar Singha Roy, M.A., B.L.
7. Mr. Kishori Mohan Das.
8. Mr. Haripada Chatterjee.
9. Mr. B. K. Das, M.C.A.

Agricultural Research Sub-Committee.

1. President.
2. Agricultural Commissioner with the Government of India.
3. Director of Agriculture, West Bengal.
4. Director of Agriculture, Assam.
5. Mr. Purandar Sarma.
6. Rai Bahadur Raghubans Prosad Singh, M.L.C.
7. Mr. Baidyanath Chowdhury.
8. Director of Agriculture, Bihar.
9. Director of Agriculture, Orissa.
10. Mr. John A. Manawwar.
11. Mr. Sudhangshu Sekhar Singh Roy.
12. Mr. Lakshmipat Singhania.

Co-opted Members.

1. Prof. S. P. Agharkar.
2. Prof. S. N. Bose.
3. Dr. J. N. Mukherjee.

Technological Research Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E.
3. Agricultural Commissioner with the Government of India.
4. Dr. K. Venkataraman.
5. Mr. J. N. Sen Gupta.
6. Mr. K. D. Jalan.
7. Mr. Bhagirath Kanoria.
8. Mr. Mohan Lal Jeloka.
9. Rai Bahadur Raghubans Prosad Singh, M.L.C.
10. Director of Agriculture, Orissa.
11. Mr. John A. Manawwar, M.A., B.Sc. (Edin.)
12. Mr. Lakshmipat Singhania.
13. Mr. F. H. Kidd.
14. Mr. B. K. Das, M.C.A.

Co-opted Members.

1. Mr. S. E. Kumana.
2. Dr. W. C. Macmillan.
3. Prof. B. C. Guha.
4. Prof. J. K. Chowdhury.
5. Mr. C. R. Nodder.

Economic Research & Publicity Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E.
3. Mr. L. K. Jha.
4. Director of Agriculture, West Bengal.
5. Director of Agriculture, Bihar.
6. Mr. T. B. Elley.
7. Mr. K. D. Jalan.
8. Mr. Haripada Chatterjee, M.L.A.
9. Director of Agriculture, Assam.
10. Mr. Purandar Sarma.
11. Director of Agriculture, Orissa.
12. Mr. Lakshmipat Singhania.
13. Mr. F. H. Kidd.
14. Mr. B. K. Das, M.C.A.

Co-opted Members.

1. Prof. P. C. Mahalanobis, F.R.S.
2. Prof. J. C. Sinha, Ph.D.
3. Mr. D. K. Sanyal.
4. The Registrar of Co-operative Societies, Orissa.
5. Mr. B. C. Ghosh.
6. Mr. D. Ghosh.

Agricultural Research Appointments Sub-Committee.

1. President.
2. Dr. J. N. Mukherjee, D. Sc., C.B.E.
3. Prof. S. P. Agharkar, M.Sc., Ph.D., F.N.I.
4. Prof. S. N. Bose, M.Sc., F.N.I.
5. Mr. Baidyanath Chowdhury.

Technological Research Appointments Sub-Committee.

1. President.
2. Sree Basanta Kumar Das, M.C.A.
3. Dr. K. Venkataraman.
4. Mr. K. D. Jalan.
5. Mr. J. N. Sen Gupta.

Economic Research and Publicity Appointments Sub-Committee.

1. President.
2. Mr. I. G. Kennedy, C.B.E.
3. Sri Basanta Kumar Das, M.C.A.
4. Sri Kishori Mohan Das.
5. Dr. J. C. Sinha.

Marketing Appointments Sub-Committee.

1. President.
2. Sri Basanta Kumar Das, M.C.A.
3. Agricultural Marketing Adviser to the Government of India.
4. Mr. T. B. Elley.
5. Mr. Mohan Lal Jeloka.
6. Mr. Sudhangshu Sekhar Singha Roy, M.A., B.L.

APPENDIX VII

List of Scientific and other Officers of the Indian Central Jute Committee as on the 1st April, 1950.

Administration.

1. Secretary	...	Dr. J. V. Lakhani, M.Sc., A.I.I.Sc., Ph.D. (Edin)
2. Superintendent	...	Shri S. K. Acharyya, M.A., B.Com., B.Sc., B.L.
3. Head Assistant	...	Shri S. C. Das, M.A., B.Com.
4. Accountant	...	Shri P. N. Sen.

Economic Research Section.

5. Director	...	Shri K. C. Basak, B.A., (Cantab).
6. Statistical Officer	...	Vacant.
7. Marketing Officer	...	Vacant.
8. Assistant Marketing Officer.	...	Shri S. M. Gupta, B. Ag.
9. Supervisor	...	Shri S. M. Ganguli, M.A., B.L.
10-12. Statistical Assistants	...	Shri D. C. Biswas, M.A. Shri T. B. Banerjee, M.A. Shri A. K. Bhattacharyya, M.A.
13. Librarian	...	Shri D. C. Roy, M.A. (Double).

Publicity Section.

14. Publicity Officer	...	Vacant.
15. Publicity Assistant	...	Shri M. C. Mukherjee, M.A.

Jute Agricultural Research Institute.

16. Director ... Dr. B. C. Kundu, M.A., Ph.D., F.L.S., F.N.I.

Agronomical Section

17. Agronomist ... Shri A. T. Sanyal, B. Sc. (Ag.), Assoc. I.A.R.I.

18-19. Assistants ... Shri B. K. Das, B.Sc. (Ag.)
Shri D. B. Dua, B. Ag.

Botanical Section

20. Botanist ... Shri B. Das Gupta, M.Sc.

21. Assistant Botanist ... Shri A. K. Paul, M.Sc., Assoc. I.A.R.I.

22-23. Assistants ... Shri K. L. Ghosh, B.Sc., B.Ag.
Shri M. S. Sarma, M.Sc.

24. Anatomical Assistant ... Shri N. S. Rao, M.Sc. (Ag.)

25. Junior Anatomical Assistant ... Shri S. K. Mukherjee, M.Sc.

Physiological Section.

26. Physiologist ... Dr. B. K. Kar, M.Sc., Ph.D. (Leipzig).

27. Assistants ... Vacant.

Cytogenetical Section.

28. Cytogeneticist ... Vacant.

29. Assistant ... Shri R. M. Dutt, M.Sc.

Chemical Section.

30. Assistant Chemist ... Dr. M. K. Mukherjee, M.Sc., Ph.D.

31. Microbiological Assistant Shri R. Bose, M.Sc.

32. Junior Assistant ... Shri G. Halder, B.Sc.

Mycological Section.

33. Assistant Mycologist ... Shri T. Ghosh, M.Sc.

34. Assistant ... Shri K. V. George, M.Sc., Ag.

35. Junior Assistant ... Shri M. Basak, B.Sc.

Entomological Section.

36. Assistant Entomologist ... Shri N. Dutt, M.Sc.

37. Assistant ... Shri P. K. Mukherjee, M.Sc.

38. Junior Assistant ... Shri N. Sen Gupta, B.Sc.

Statistical Section.

39. Statistician ... Vacant.

40. Assistants ... Vacant.

Substitute Fibre Section.

41. Assistant Botanist ... Shri K. P. Roy, L.Ag., Assoc. I.A.R.I.

42. Assistants ... Vacant.

43. Librarian ... Shri S. Banerjee, B.Sc.

44. Head Clerk ... Shri R. C. Chakravarty, B.A.

Technological Research Laboratories.

45. Director ... Mr. C. R. Nodder, O.B.E., M.A. (Cantab) (upto July 18, 1949).

Dr. P. B. Sarkar, D.Sc., F.N.I. (offg.)

46. Manager ... Shri S. S. Paul, B.Sc.

47. Senior Research Physicist Dr. K. R. Sen, D.Sc.

48. Senior Research Chemist (Offg.) ... Dr. H. Chatterjee, M.Sc., D.Phil, F.R.I.C.

49. Junior Research Assistant (Chemist)	...	Vacant.
50. Junior Research Assistant (Physicist)	...	Shri S. B. Bandopadhayay, M.Sc.
51. Head Tester	...	Shri S. R. Guha, B.Sc.
52-53. Senior Testers	...	Shri A. K. Mazumdar, B.Sc. (Hons.) Shri S. K. Bose, B.Sc.
54. Manager's Assistant	...	Shri P. K. Deb, B.Sc.
55. Statistical Clerk	...	Shri S. K. Mukhopadhyay, B.Sc.
56-64. Junior Testers	...	Shri U. Chatterjee, B.Sc. Shri K. B. Pal, B.Sc. Shri S. R. Das, B.Sc. Shri H. Ghosh, B.Sc. Shri S. K. Guha, B.Sc. Shri B. K. Bose, B.Sc. Shri S. S. Bhattacharjee, B.Sc. Shri N. K. Sil, B.Sc. Shri B. B. Bhowmik, B.Sc.
65. Electrician	...	Shri R. K. Bhattacharjee.
66. Librarian	...	Shri P. R. Mukherjee, B.Sc. (Hons.)
67. Head Clerk	...	Shri T. C. Chakrabarty.

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS.	Rs.	A.	P.	Rs.	A.	P.
OPENING BALANCE—						
Cash in Hand ...	20	15	6			
With Imperial Bank of India in Current Account ...	5,62,339	8	7			
Cash at Sub-offices ...	580	0	0			
Investment in 3% Government Loan 1963/65 (Face value Rs. 25,000/-) ...	24,671	0	0			
				5,87,611	8	1
(A) MONEY RECEIVED UNDER RESOLUTION—						
No. F.254/34/A of the Govt. of India, late Deptt. of Education, Health and Lands, dated Simla, the 28th May, 1936 ...				10,00,000	0	0
(B) OTHER MONEYS RECEIVED BY THE SOCIETY—						
(i) Proceeds realised by sale of I.C.J.C. publications ...	1,683	1	0			
(ii) Proceeds realised by sale of advertisement space in the Committee's Bulletin ...	996	14	0			
(iii) Miscellaneous ...	7,642	1	6			
(iv) Realisation of a part of the cost of Jute Seeds from Travancore State Government ...	9,345	3	6			
Carried over ...	19,667	4	0	15,87,611	8	1

VIII

JUTE COMMITTEE.

for the year ended 31st March, 1950.

EXPENDITURE.	Rs.	A.	P.	Rs.	A.	P.
ADMINISTRATION OF THE SOCIETY						
Pay of Officers ...	12,000	0	0			
Pay of Establishment ...	27,026	5	0			
Allowances ...	25,400	9	0			
Medical Aid ...	3,950	11	0			
Contingencies ...	34,767	8	3			
Grant-in-aid, Contributions, etc.	2,404	3	0			
				1,05,549	4	3
MEASURES TAKEN IN CONNECTION WITH THE WORK ON THE IMPROVEMENT OF THE AGRICULTURE OF JUTE.						
(I) RECURRING—						
Pay of Officers ...	27,391	4	0			
Pay of Establishment ...	54,934	8	0			
Allowances ...	52,968	3	0			
Medical Aid	3,576	14	0			
Supplies & Services ...	9,445	5	3			
Contingencies ...	38,547	10	9			
Maintenance of Station Wagon	3,082	15	3			
Grant-in-aid, Contributions etc.	5,302	13	0			
University Schemes ...	22,158	0	0			
Subvention Farms in Bengal, Bihar, Assam & Orissa ...	1,871	0	0			
Pest & Disease Control Scheme	60	0	0			
Study of Substitute fibre ...	11	10	0			
Carried over ...	2,19,350	3	3	1,05,549	4	3

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS. (*Contd.*)	Rs.	A.	P.	Rs.	A.	P.
Brought Forward ...	19,667	4	0	15,87,611	8	1
(B) OTHER MONEYS RECEIVED BY THE SOCIETY (*contd.*)						
(v) Refund of Grants made to the Govt. of Bihar in 1948-49 towards Special Agricultural Staff etc. ...	48,600	0	0			
				68,267	4	0
(C) INTEREST ON INVESTMENTS ...				748	0	0
(D) MONEY REALISED FROM PROVIDENT FUND ACCOUNT— (*Vide* Statement of Receipts and Payment for the year ended the 31st March, 1949) ...				847	6	0
Carried over ...	...			16,57,474	2	1

VIII.

JUTE COMMITTEE.

for the year ended 31st March, 1950.

EXPENDITURE. (*Contd.*)	Rs.	A.	P.	Rs.	A.	P.
Brought Forward ...	2,19,350	3	3	1,05,549	4	3
(II) *Non-Recurring*—						
Expenditure in connection with the setting up of Jute Agricultural Research Institute ...	27,059	12	3			
				2,46,409	15	6
MEASURES TAKEN IN CONNECTION WITH IMPROVEMENT IN THE TECHNOLOGY OF JUTE.						
(I) *Recurring*—						
Pay of Officers ...	45,032	6	0			
Pay of Establishment ...	59,491	14	0			
Allowances ...	60,046	15	0			
Supplies & Services ...	24,027	13	3			
Contingencies ...	11,208	4	6			
Grant-in-aid, Contributions etc.	6,198	5	0			
University Schemes ...	36,991	0	6			
Medical aid ...	3,494	7	3			
(II) *Non-Recurring*—						
Extension of the Batching room of the Technological Research Laboratories ...	4,898	8	0			
(III) T. R. EXTENSION SCHEME						
Non-Recurring—						
Equipment etc. ...	6,082	6	9			
				2,57,472	0	3
Carried over ...	...			6,09,431	4	0

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INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS. (*Contd.*)	Rs.	A.	P.	Rs.	A.	P.
Brought Forward ...	...			16,57,474	2	1
Carried over ...	...			16,57,474	2	1

VIII.

JUTE COMMITTEE.

for the year ended 31st March, 1950.

EXPENDITURE. (*Contd.*)	Rs.	A.	P.	Rs.	A.	P.
Brought Forward ...	...			6,09,431	4	0
MISCELLANEOUS—						
(I) ECONOMIC RESEARCH & MARKETING SCHEME.						
Pay of Officers ...	14,418	7	0			
Pay of Establishment ...	35,231	14	0			
Allowances ...	26,586	1	0			
Medical Aid ...	2,586	8	0			
Contingencies ...	18,568	5	1			
Grant-in-aid, Contributions etc.	2,834	14	0			
Scheme for Economics of Jute growing and Dr. J. C. Sen Gupta's Scheme ...	36,883	10	3			
				1,37,109	11	4
(II) PUBLICITY SECTION—						
Pay of Officers ...	1,828	5	0			
Pay of Establishment ...	7,411	5	0			
Allowances ...	7,403	6	0			
Medical Aid ...	1,195	3	0			
Contingencies ...	9,149	3	3			
Grant-in-aid, Contributions etc.	600	1	0			
Jute Museum ...	10,561	0	6			
				38,148	7	9
(III) JUTE DEVELOPMENT SCHEME						
Main Scheme for West Bengal, Assam, Bihar & Headquarters—						
West Bengal ... 77,469 10 3						
Bihar ... 42,233 1 9						
Assam ... 38,155 6 9						
Headquarters ... 14,088 11 6						
	1,71,946	14	3			
Carried over ...	1,71,946	14	3	7,84,689	7	1

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS (*Contd.*)	Rs.	A.	P.	Rs.	A.	P.
Brought Forward ...	...			16,57,474	2	1
Carried over ...	...			16,57,474	2	1

VIII.

JUTE COMMITTEE.

for the year ended 31st March, 1950.

EXPENDITURE (*Contd.*)	Rs. A. P.	Rs. A. P.
Brought Forward ...	1,71,946 14 3	7,84,689 7 1
TRAVANCORE SCHEME—		
Pay ... 6,017 1 0		
Seeds ... 18,571 12 0	24,588 13 0	
Madras	1,358 9 0	
PLANT PROTECTION SCHEME—		
West Bengal ... 6,546 7 3		
Bihar ... 2,754 7 0		
Assam ... 3,909 15 3		
	13,210 13 6	
		2,11,105 1 9
(IV) EXTRA EXPENDITURE FOR IMPLEMENTATION OF THE CENTRAL PAY COMMISSION'S RECOMMENDATIONS WITH REGARD TO THE REVISION OF PAY SCALES OF THE STAFF WITH EFFECT FROM THE 1ST JANUARY, 1947.		
Administration ...	718 14 0	
Agricultural Research Institute	1,648 13 0	
Economic Research & Marketing Sections ...	906 14 0	
Publicity Section ...	407 10 0	
		3,682 3 0
(V) REFUND OF SUBSCRIPTION RECEIVED FOR PAYMENT TO GANDHI NATIONAL MEMORIAL FUND (*Vide* STATEMENT OF RECEIPT & EXPENDITURE ACCOUNT ENDED 31ST MARCH, 1949). ...		33 8 0
Carried over ...	...	9,99,510 3 10

APPENDIX

INDIAN CENTRAL

Statement of Receipts and Payments

RECEIPTS (*Contd.*)	Rs. A. P.	Rs. A. P.
Brought Forward	...	Rs. 16,57,474-2-1
		Rs. 16,57,474-2-1

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AUDITORS' REPORT:

We beg to report that we have audited the Statement of Receipts and Expenditure of the Indian Central Jute Committee for the year ended 31st March 1950 and above set forth, with the accounts and vouchers, and have obtained all the informations and explanations we have required. In our opinion such statement correctly sets forth the transactions of the Committee for the year.

CALCUTTA,
6, Hastings Street,
The 17th June, 1950.

G. BASU & CO.,
Chartered Accountants,
Auditors.

VIII.

JUTE COMMITTEE.

for the year ended 31st March, 1950.

EXPENDITURE (*Contd.*)	Rs. A. P.	Rs. A. P.
Brought Forward	...	9,99,510-3-10
(VI) Money paid to I.C.J.C. (*Vide* Balance Sheet of Provident Fund Account of the 31st March 1948)		7-2-0
(VII) Money paid from I.C.J.C. Provident Fund Account Account to pay Provident Fund dues of subscriber. (Amount to be realised from the I.C.J.C. Provident Fund Account and reimbursed to the Committee)		0-2-0
(VIII) BALANCE ON THE 31ST MARCH, 1949		
In Hand	69-3-3	
With Imperial Bank of India on Current Account	6,32,636-7-0	
At Sub-Offices	580-0-0	
Investment on 3% Government Loan 1963-65 (Face Value Rs. 25,000/-)	24,671-0-0	6,57,956-10-3
		Rs. 16,57,474-2-1


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APPENDIX

Summary of Receipts and Expenditure of the Indian Central Jute

RECEIPTS.

Sources of receipt. 1	1936-37 2	1937-38 3	1938-39 4	1939-40 5	1940-41 6	1941-42 7	1942-43 8	1943-44 9	1944-45 10	1945-46 11	1946-47 12	1947-48 13	1948-49 14	1949-50 15	TOTAL
(1) Opening balance ...	...	4,626	2,02,424	27,814	51,649	63,437	2,04,731	73,321	2,15,730	1,79,168	2,00,015	2,65,748	4,50,663	5,87,611	25,26,937
(2) Grant-in-aid received from the Government of India ...	20,000	5,00,000	4,25,000	4,25,000	4,18,500	4,56,300	3,52,420	4,90,000	5,00,000	5,80,800	7,30,000	8,62,800	10,00,000	10,00,000	77,60,820
(3) Contributions received from the Provincial Governments towards the cost of the schemes undertaken by the Committee	...	...	32,500	35,000	62,500	79,257	3,500	4,745	11,087	8,014	363	...	...	...	2,36,966
(4) Other moneys received by the Committee ...	...	113	580	1,472	2,321	5,814	31,593	6,222	10,211	6,153	11,740	9,416	17,670	69,115	1,72,420
(5) Interest received from investment of the funds of the Committee	...	1,125	1,025	2,740	2,116	2,193	1,715	901	955	951	857	748	748	748	16,822
(6) Transfer from the permanent advance account opened for supply of jute seeds of improved varieties ...	...	...	...	49,688	...	...	49,342	...	...	...	...	...	...	...	99,030
Total ...	20,000	5,05,864	6,61,529	5,41,714	5,37,086	6,07,001	6,43,301	5,75,189	7,37,983	7,75,086	9,42,975	11,38,712	14,69,081	16,57,474	1,08,12,995

X.

Committee from its inception in 1936-37 to 1949-50.

EXPENDITURE.

Details of expenditure 1	1936-37 2	1937-38 3	1938-39 4	1939-40 5	1940-41 6	1941-42 7	1942-43 8	1943-44 9	1944-45 10	1945-46 11	1946-47 12	1947-48 13	1948-49 14	1949-50 15	TOTAL
(1) Administration of the Committee	15,374	68,988	67,778	69,359	67,789	70,018	56,969	53,066	52,287	60,426	65,926	72,096	83,247	1,05,549	9,08,873
(2) Measures taken in connection with work on the improvement of the Agriculture of jute	...	24,686	35,499	44,724	49,329	55,253	82,083	97,511	91,556	1,18,801	1,40,058	1,70,893	2,04,480	2,46,410	13,61,283
(3) Jute Development Scheme ...	...	...	...	...	...	...	...	...	...	...	...	...	86,811	2,11,105	2,97,916
(4) Measures taken in connection with improvement in the Technology of jute ...	...	1,61,782	2,98,791	1,20,543	1,09,876	1,03,111	1,97,922	1,54,849	1,52,490	1,63,902	2,07,443	2,35,939	2,26,322	2,57,472	23,90,442
(5) Measures taken in connection with improvement in the Marketing of jute ...	...	16,744	54,449	44,471	43,364	22,463	44,725	27,501	25,936	41,964	55,361	32,672	...	...	4,09,650
(6) Scheme for the improvement of jute Forecast ...	...	13,984	69,964	89,359	1,17,867	1,30,612	22,039	...	6,000	...	...	...	...	...	4,49,825
(7) Scheme for Economic Research and Publicity on jute and Measures taken in connection with improvement in the Marketing of jute from 1948—49 ...	...	2,135	4,490	8,144	19,505	20,785	21,994	26,246	46,079	65,961	79,368	1,06,228	1,29,323	1,75,258	7,05,516
(8) Scheme for the employment of Special Agricultural Staff in Bengal, Bihar, Assam, and Orissa ...	...	15,121	52,944	64,103	65,909	...	1,43,513	286	1,83,248	1,21,606	1,29,070	70,221	43,202	...	8,89,223
(9) Expenditure for revision of pay scales of staff ...	...	...	...	...	...	...	...	...	...	...	...	...	1,07,233	3,682	1,10,915
(10) Permanent advance account for supply of jute seeds of improved varieties ...	...	...	49,688	49,342	...	...	...	...	...	...	...	...	...	...	99,030
(11) Miscellaneous	...	...	112	20	10	28	735	...	1,219	2,411	...	...	851	41	5,427
(12) Closing balance ...	4,626	2,02,424	27,814	51,649	63,437	2,04,731	73,321	2,15,730	1,79,168	2,00,015	2,65,748	4,50,663	5,87,612	6,57,957	31,84,895
Total ...	20,000	5,05,864	6,61,529	5,41,714	5,37,086	6,07,001	6,43,301	5,75,189	7,37,983	7,75,086	9,42,975	11,38,712	14,69,081	16,57,474	1,08,12,995

APPENDIX X

Abstract revised budget estimates of the Indian Central Jute Committee for the year 1949-50 and budget estimates for the year 1950-51

SCHEMES.	Revised estimates for 1949-50.	Budget estimates for 1950-51.
	Rs.	Rs.
1. Administration ...	99,900	97,200
2. A scheme of Agricultural Research on Jute ...	3,11,860	2,96,300
3. A scheme for setting up of an Institute for research on the Technology of Jute ...	3,21,555	2,66,500
4. A scheme for the collection and distribution of statistics and information on Jute ...		
(*a*) Economic Research Section ...	1,53,500	1,46,000
(*b*) Publicity Section ...	52,500	53,000
5. Jute Development Scheme ...	4,55,403	4,59,804
6. Funds required for implementing Pay Commission's recommendations ...	47,900	17,050
7. Amount provided to meet 50% of the loss incurred by Government of Bihar in transaction of Jute Seeds in 1947-48 ...	26,380	...
Total ...	14,68,998	13,35,854
Add closing balance ...	20,000	20,000
	14,88,998	13,55,854


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